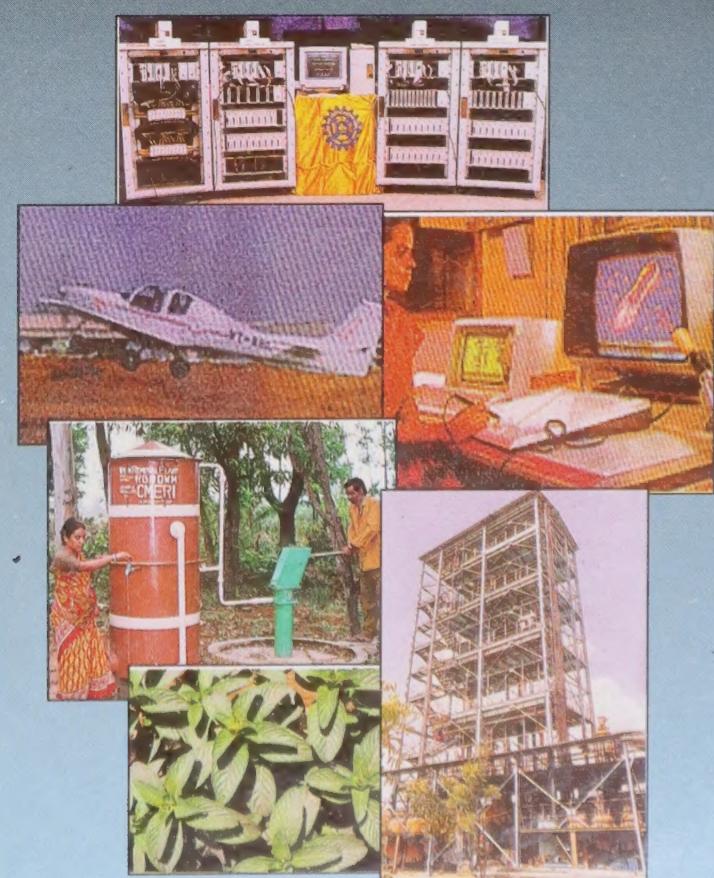


CSIR 2000 : A PROFILE

CSIR 2000 : A PROFILE



CSIR 2000 : A PROFILE



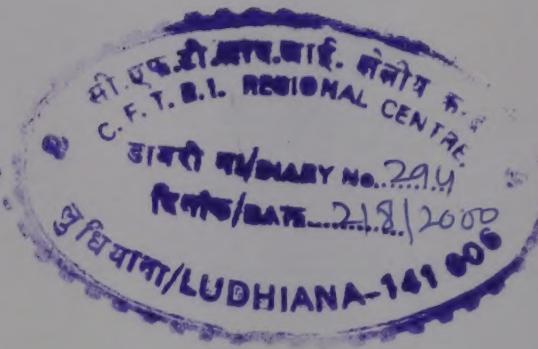
CSIR ESTABLISHMENTS

CBRI	Central Building Research Institute, Roorkee - 247 667
CBT	Centre for Biochemical Technology, Delhi - 110 007
CCMB	Centre for Cellular and Molecular Biology, Hyderabad - 500 007
CDRI	Central Drug Research Institute, Lucknow - 226 001
CECRI	Central Electrochemical Research Institute, Karaikudi - 623 006
CEERI	Central Electronics Engineering Research Institute, Pilani - 333 031
CFRI	Central Fuel Research Institute, Dhanbad - 828 108
CFTRI	Central Food Technological Research Institute, Mysore - 570 013
CGCRI	Central Glass and Ceramic Research Institute, Calcutta - 700 032
CIMAP	Central Institute of Medicinal & Aromatic Plants, Lucknow - 226 016
CLRI	Central Leather Research Institute, Chennai - 600 020
CMERI	Central Mechanical Engineering Research Institute, Durgapur - 713 209
CMRI	Central Mining Research Institute, Dhanbad - 826 001
CRRI	Central Road Research Institute, New Delhi - 110 020
CSIO	Central Scientific Instruments Organisation, Chandigarh - 160 020
CSMCRI	Central Salt & Marine Chemicals Research Institute, Bhavnagar - 364 002
IHBT	Institute of Himalayan Bioresource Technology, Palampur - 176 061
IICB	Indian Institute of Chemical Biology, Calcutta - 700 032
IICT	Indian Institute of Chemical Technology, Hyderabad - 500 007
IIP	Indian Institute of Petroleum, Dehradun - 248 005
IMT	Institute of Microbial Technology, Chandigarh - 160 036
INSDOC	Indian National Scientific Documentation Centre, Delhi - 110 067
ITRC	Industrial Toxicology Research Centre, Lucknow - 226 001
NAL	National Aerospace Laboratories, Bangalore - 560 017
C-MMACS	CSIR Centre for Mathematical Modelling and Computer Simulation, Bangalore-560 037
NBRI	National Botanical Research Institute, Lucknow - 226 001
NCL	National Chemical Laboratory, Pune - 411 008
NEERI	National Environmental Engineering Research Institute, Nagpur - 440 020
NGRI	National Geophysical Research Institute, Hyderabad - 500 007
NIO	National Institute of Oceanography, Goa - 403 004
NISCOM	National Institute of Science Communication, New Delhi - 110 012
NISTADS	National Institute of Science Technology and Development Studies, New Delhi - 110 012
NML	National Metallurgical Laboratory, Jamshedpur - 831 007
NPL	National Physical Laboratory, New Delhi - 110 012
RRL,BHO	Regional Research Laboratory, Bhopal - 462 026
RRL,BHU	Regional Research Laboratory, Bhubaneswar - 751 013
RRL,JM	Regional Research Laboratory, Jammu Tawi -180 001
RRL,JT	Regional Research Laboratory, Jorhat - 785 006
RRL,TVM	Regional Research Laboratory, Thiruvananthapuram - 695 019
SERC,G	Structural Engineering Research Centre, Ghaziabad - 201 001
SERC,M	Structural Engineering Research Centre, Chennai- 600 113

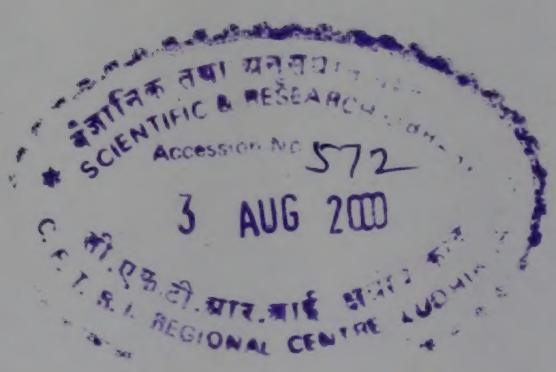
CSIR : Corporate Affairs

- R&D Planning and Business Development Division (RPBDD)
- International Science and Technology Affairs Directorate (ISTAD)
- Human Resource Development Group (HRDG)
- Intellectual Property Management Division (IPMD)
- Societal and Technology Mission and Societal Programmes Division (STMD)
- Unit for Science Dissemination (USD)

ABERNY
2/8/2K



CSIR 2000: A Profile



CSIR, INDIA

The Great Chain of R & D Laboratories

★ Head Quarters
CSIR-BRAIN BANK

PHYSICAL SCIENCES

1. Central Electronics Engineering Research Institute, Pillani
2. Central Scientific Instruments Organisation, Chandigarh
3. National Geophysical Research Institute, Hyderabad
4. National Institute of Oceanography, Goa
5. National Physical Laboratory, New Delhi

CHEMICAL SCIENCES

6. Central Electrochemical Research Institute, Karaikudi
7. Central Leather Research Institute, Chennai
8. Central Salt & Marine Chemicals Research Institute, Bhavnagar
9. Indian Institute of Chemical Technology, Hyderabad
10. Indian Institute of Petroleum, Dehradun
11. Regional Research Laboratory, Jorhat
12. National Chemical Laboratory, Pune



BIOLOGICAL SCIENCES

13. Central Drug Research Institute, Lucknow
14. Central Food Technological Research Institute, Mysore
15. Central Institute of Medicinal and Aromatic Plants, Lucknow
16. Centre for Biochemical Technology, New Delhi
17. Centre for Cellular & Molecular Biology, Hyderabad
18. National Botanical Research Institute, Lucknow
19. Indian Institute of Chemical Biology, Calcutta
20. Industrial Toxicology Research Centre, Lucknow
21. Institute of Microbial Technology, Chandigarh
22. Regional Research Laboratory, Jammu
23. Institute of Himalayan Bioresource Technology, Palampur

ENGINEERING SCIENCES

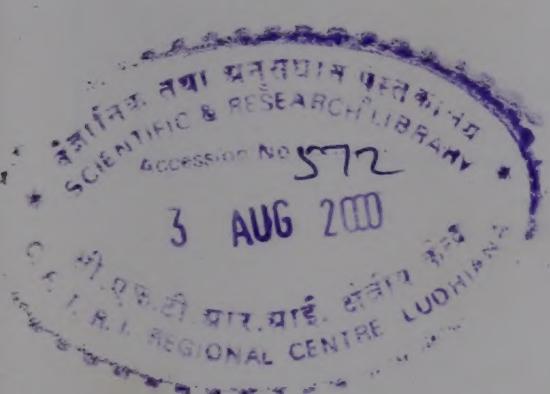
24. Central Building Research Institute, Roorkee
25. Central Fuel Research Institute, Dhanbad
26. Central Glass & Ceramic Research Institute, Calcutta
27. Central Mining Research Institute, Dhanbad
28. Central Road Research Institute, New Delhi
29. National Aerospace Laboratories, Bangalore
30. National Metallurgical Laboratory, Jamshedpur
31. National Environmental Engineering Research Institute, Nagpur
32. Regional Research Laboratory, Thiruvananthapuram
33. Regional Research Laboratory, Bhopal
34. Regional Research Laboratory, Bhubaneswar
35. Structural Engineering Research Centre, Ghaziabad
36. Structural Engineering Research Centre, Chennai
37. Central Mechanical Engineering Research Institute, Durgapur

INFORMATION SCIENCES

38. National Institute of Science, Technology and Development Studies, New Delhi
39. Indian National Scientific Documentation Centre, New Delhi
40. National Institute of Science Communication, New Delhi

THIS IS A SCHEMATIC REPRESENTATION OF THE MAP OF INDIA (NOT TO SCALE) AND DOES NOT INDICATE INDIA'S TERRITORIAL BOUNDARIES

CSIR 2000 : A PROFILE



COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH
NEW DELHI - 110 001
2000

Edited and Compiled by

T D NAGPAL
Scientist
Unit for Science Dissemination

Supported by

KULDEEP SINGH SEZWAL
S R VERMA

राष्ट्रीय विज्ञान एवं विनियोग संसाधन बोर्ड
(CSIR)

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

PRESIDENT

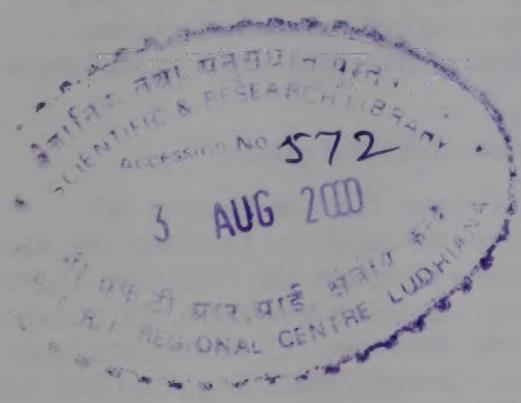
Shri Atal Behari Vajpayee
Prime Minister of India

VICE-PRESIDENT

Prof. Murli Manohar Joshi
Minister of Science & Technology
Govt of India

DIRECTOR-GENERAL

Dr. R.A. Mashelkar, FRS
Secretary
Department of Scientific & Industrial
Research



Council of Scientific & Industrial Research (CSIR)

AT A GLANCE

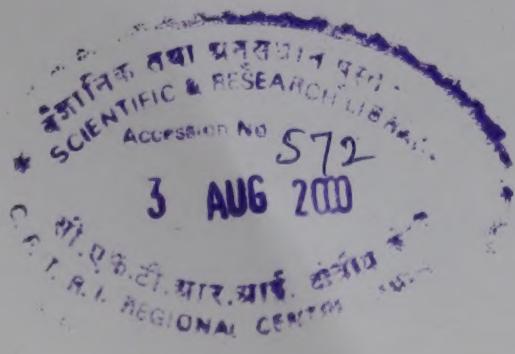
Corporate Office	:	2, Rafi Marg, New Delhi-110001
Establishment	:	1942
Laboratories	:	40
Total Staff	:	23,000
Scientists	:	5,300 (60% Ph.D.s)
Technologies Developed	:	4000
Industrial Production (Based on CSIR technologies) per annum	:	Rs 4500 Crore

Human Resource Development

Research Fellowship/Associateship awarded	:	50,000
Support extended to brilliant Young Scientists	:	10,000
Instituted Programme for Youth for Leadership in Science (CPYLS)	:	50 top students (Xth Standard) selected annually for support to develop career in Science

IPR

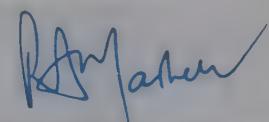
Patents Filed (1998-99) (Highest Number in the country by any organisation)	:	310 India 112 Abroad
Mission	:	To provide scientific industrial research and development that maximises the economic, environmental and societal benefit for the people of India.
Budget	:	Rs 800 Crores (US\$ 200 million)
Important Global Clients	:	Neste Oy, Finland; General Electric, US; Polaroid Corp, US; Genencor, CytoMed, US; Abbott Labs, US; SmithKline Beecham, US; FMC Corp, DuPont, US; CytoMed Inc, US; Stone & Webster, US; Lummus & Crest, US; UOP Inter-American, US; Amoco, US; Mobil, US; Locweld Inc, Canada; Zelleco Engg Sbd Bhd, Malaysia; Bexmico Pharma, Bangladesh; Novo, Nordisk, Denmark; Boeing Corp, US; Civil Aviation Authority, UK



FOREWORD

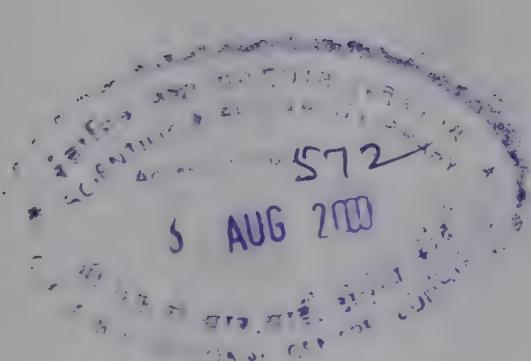
Council of Scientific and Industrial Research, India is perhaps among the world's largest publicly funded R&D organisations. Its chain of 40 world-class R&D establishments with their 80 field stations spread across India are manned by 10,000 highly qualified scientists and engineers, besides 13,000 auxiliary and other staff. Its range of activities cover practically the entire spectrum of industrial R&D ranging from aerospace to mining to microelectronics to metallurgy and so on. CSIR is truly a global R&D resource as its patrons and partners hail from over 50 countries.

CSIR 2000 : A Profile gives in some detail, information on the current activities and programmes, recent accomplishments, and more importantly, the core competencies of its constituents. I am confident that the publication will be of value to those seeking to create knowledge networks with CSIR and even to those, who have a general interest in S&T.

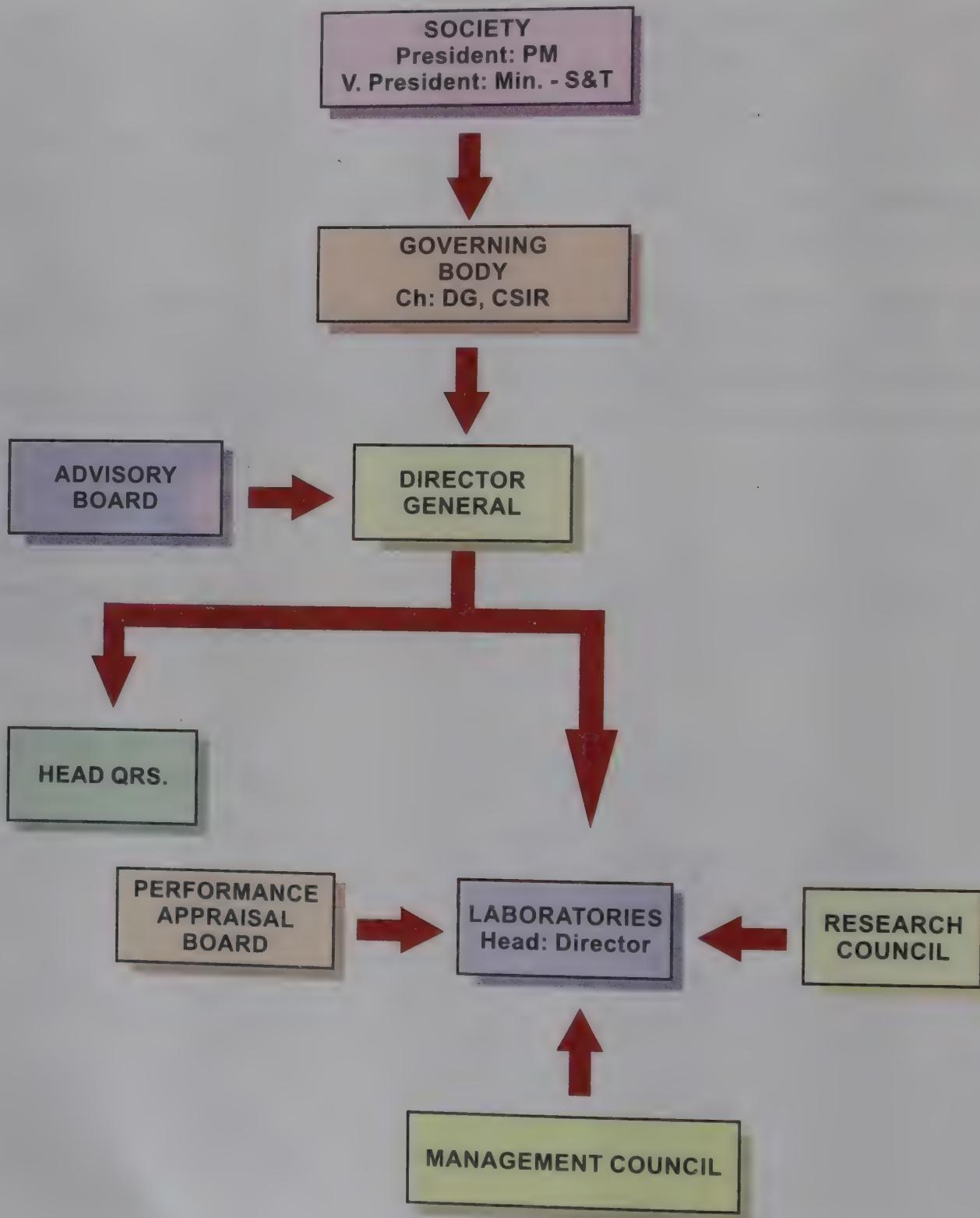


(R A MASHELKAR)

Director-General
Council of Scientific & Industrial Research



CSIR ORGANISATIONAL STRUCTURE



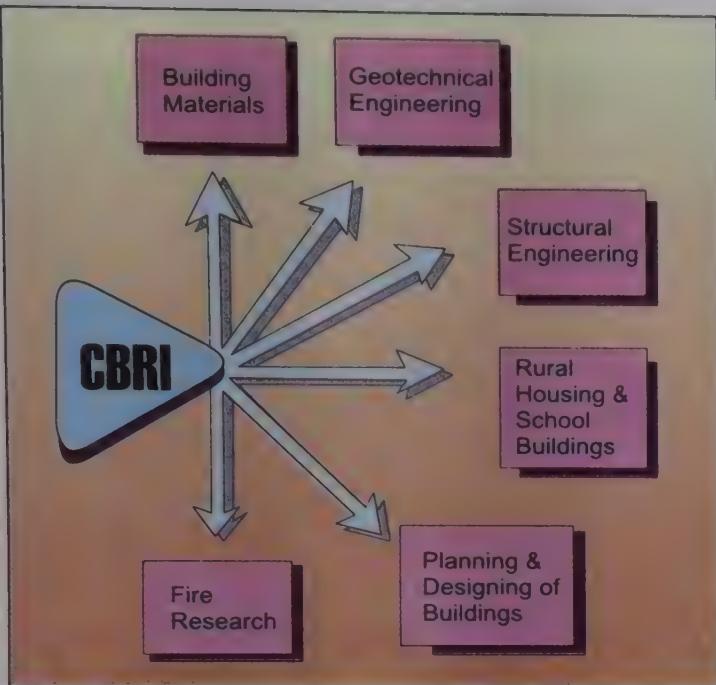
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Central Building Research Institute (CBRI)

Roorkee 247 667

Telephone: 72243, 72269, 72293

Telegram: BILD SERCH ROORKEE

Fax: 72272, 72543

E.Mail: general@cscbri.ren.nic.in

general@cbri.sirnetd.ernet.in

STD Code: 01332

Established: 1947

Director

Prof. R.N. Iyengar

Grant

1998-99

Rs.1280 Lacs

Manpower

Scientific & Technical: 160

Total: 600

MANDATE

- To assist the building industry in solving problems relating to planning, foundation, materials, design and construction, functional efficiency, speed, economy and productivity in building construction including fire hazards in buildings.

MAJOR R&D PROGRAMMES

- ★ Shelter Planning, New Materials, Structural and Foundation Engineering, Disaster Mitigation, Process Development.

SIGNIFICANT ACHIEVEMENTS

Design and development of thermally efficient high draught and fixed chimney brick kiln, production of bricks from inferior soils, mechanisation of brick and tile production.

Development of wood substitute, building materials using agro-products and industrial wastes, protective coatings for concrete and steel structures & reinforcement, sealants, adhesives and waterproofing systems for buildings.

★ Masonry cements and other cementitious binders from agro-industrial wastes, low temperature cements.

★ Lime shaft kilns, lime hydrating machines, slag lime bricks.

★ Termite control measures - evaluation of environmentally degradable pesticides, studies on herbal products as termite repellants, evaluation of inorganic materials as physical barriers to termites entry in buildings.

★ Climatic zonation of the country for building design, formulation of standards for thermal, acoustical and visual comfort, design of energy efficient buildings, thermal design of cold storages, impact



Brick machine

noise reduction in multistoreyed buildings, non destructive evaluation of building materials and components, acoustical design of theatres and auditoria.

★ Structural analysis and design of multistorey buildings, rehabilitation of distressed structures, earthquake engineering including strong motion instrumentation.

★ Development and design of economical foundations, underreamed bored compaction, precast spliced, skirted granular and pedestal piles.

★ Construction technologies including prefabrication and improved traditional practices, computer aided analysis and design of buildings, earthquake disaster mitigation studies, rehabilitation of distressed structures, stone blocks, solid concrete blocks for masonry, precast RC planks and channels for roofing and flooring.

★ Low-cost rural houses, latrines, prefab brick panel system, precast concrete cyclone resistant houses, timber skeleton houses,

instant shelter for disaster relief, large size biogas plants.

- ★ Design and planning of Navodaya Vidyalayas, formulation of space norms for different outdoor and indoor activities, design of school furniture and fixtures, design and guidelines for barrier free built environment for physically handicapped.
- ★ Town and country planning, formulation of space and landuse standards, expert system for computer aided architectural design and evaluation.
- ★ Studies on fire hazard and analysis - fire propagation, surface spread of flames; fire retardant treatments for thatch, wood, textiles, canvas etc.; post fire investigations, extinguishment of fires in oil storage tanks, explosion hazards and mitigations, fire barrier system for electrical cables.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Clay-flyash bricks; Sand-Lime Bricks
- ★ Wood Substitute - EPS door shutters & Coir-cement board panelled door shutter; coir - CNSL Board

★ Epoxy-phenolic IPN coating for the protection of concrete and steel structures

★ Epoxy-phenolic IPN-RB coating for the protection reinforced bars in RCC

★ Gypsum calcinator: Energy efficient

★ Lime hydrating machine

★ Polatile - polymer modified cementitious tiles

★ Fire blocking layer for aircraft seat cushions

★ Fire resistant metallic composite doors

★ Cable firestop systems for electrical cables and cable trays in cable galleries and shafts

★ Calfire - A user friendly software for fire calculations in enclosures

★ Mini climbing crane for construction of multistoreyed buildings

★ Concrete block making machine

★ Computer softwares for structure analysis

★ EWS & LIG houses for NOIDA and Ghaziabad improvement trust

★ Cyclone resistant houses



Navodaya Vidyalaya (Shimla)



Polytiles

- ★ Design and construction guidelines for community health centres in northern regions
- ★ Design of tassar cocoon grainage buildings in tropical tassar belt
- ★ Post earthquake investigations in Uttarkashi (UP), and Latur (Maharashtra)
- ★ Post fire investigations of ONGC, Bombay; AIIMS & LIC buildings, New Delhi and remedial fire protection measures
- ★ Landslide hazard zonation of Sikkim
- ★ National Housing Project in Bhutan
- ★ Housing complex for CISF at Bahadurgarh, Haryana
- ★ Housing and planning of Mathura refinery complex

TECHNOLOGIES READY FOR TRANSFER

- ★ IPN-Anticorrosive coatings
- ★ EPS-Door shutters
- ★ Polytiles
- ★ C-Bricks and its making machine
- ★ Coir Cement and Coir CNSL Board
- ★ Fire retardant doors and textiles
- ★ Concrete block making machine

- ★ Pollution control device for lime kilns
- ★ Boring and skirting machine
- ★ Prefabrication system for mass housing
- ★ Beneficiation of phosphogypsum
- ★ Electric curing of concrete poles and sleepers

FUTURE PROGRAMMES

Special emphasis will be placed on habitat planning, new building materials, disaster mitigation and distressed buildings, fire hazards and termite protection.

SPECIAL FACILITIES

Low Speed Wind Tunnel with Computer Controlled Monitoring System
 Artificial Sky for Illumination Measurements
 Heavy Testing Laboratory
 Fire Testing for building components Laboratory
 Strong motion Instrumentation laboratory
 Pest & Mycology Laboratory
 The institute also has 157 types of testing facilities for building materials and components based on BS, BIS and ASTM standards.

SERVICES OFFERED

Design of different type of foundations including pile foundation, remedial measures for distressed foundations including old monuments, slope stability and ground improvement etc., earth retaining structures, rigid walls retaining reinforced earth backfills, testing of soils, flyash, industrial & mining wastes, design of buildings/building complexes, theatres, halls etc., distressed buildings investigation and remedial measures, design of integrated village settlements, fire hazards assessment analysis.

TRAINING PROGRAMMES

The Institute imparts training in the field of building science and technology.

PUBLICATIONS

Annual Report
 Newsletter and
 Regular Building Research Notes & Brochures

CONTACT PERSON: Director Extension Centres

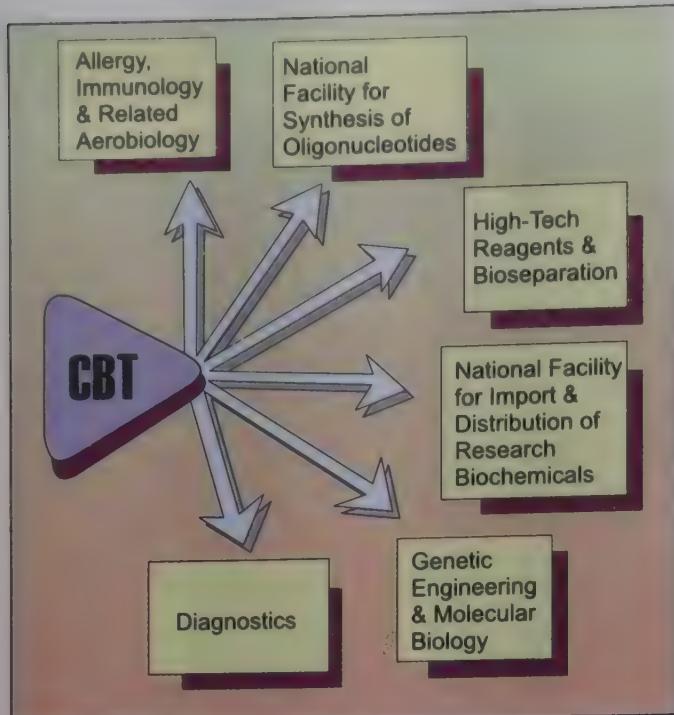
CBRI Extension Centre,
 India Habitat Centre
 VI Zone, II Floor, Lodhi Road,
 New Delhi-110003
 Tel: 4641182

CBRI Extension Centre,
 North TT Nagar, Bhopal-462003
 Tel: 552291

CBRI Extension Centre,
 6th Floor, Nizam Palace,
 234/4, Acharya J.C. Bose Road,
 Calcutta-700020
 Tel: 2477546

CBRI Extension Centre,
 C/o Research Station (R&B)
 Errum Manzil, Hyderabad-500481
 Tel: 3323521

CBRI Extension Centre,
 C/o Housing Board, E-Block,
 Shantinagar,
 Thiruvananthapuram-695001
 Tel: 330001/Ext.



Centre for Biochemical Technology (CBT)

Near Jubilee Hall, University Campus, Mall Road, Delhi 110 007

Telephone: 7257578, 7257298, 7416489

Telegram: BIOCENTRE DELHI

Fax: 7257471, 7416489

E.Mail: csircbt@del2.vsnl.net.in

STD Code: 011

Established: 1966

Director

Prof. S.K. Brahmachari

Grant

1998-99

Rs.630 Lacs

Manpower

Scientific & Technical : 65

Total: 150

MANDATE

- To translate concepts developed in basic Biological Research to commercially viable technologies for Health-Care

MAJOR R&D PROGRAMMES

- ★ Allergy, Immunology & Immunogenetics
- ★ Nucleic acids & peptide chemistry: Design & Synthesis
- ★ Diagnostics
- ★ Recombinant DNA technology
- ★ Genomics & Genome Informatics
- ★ Environmental Biotechnology
- ★ Product & Process development for biologicals

SIGNIFICANT ACHIEVEMENTS

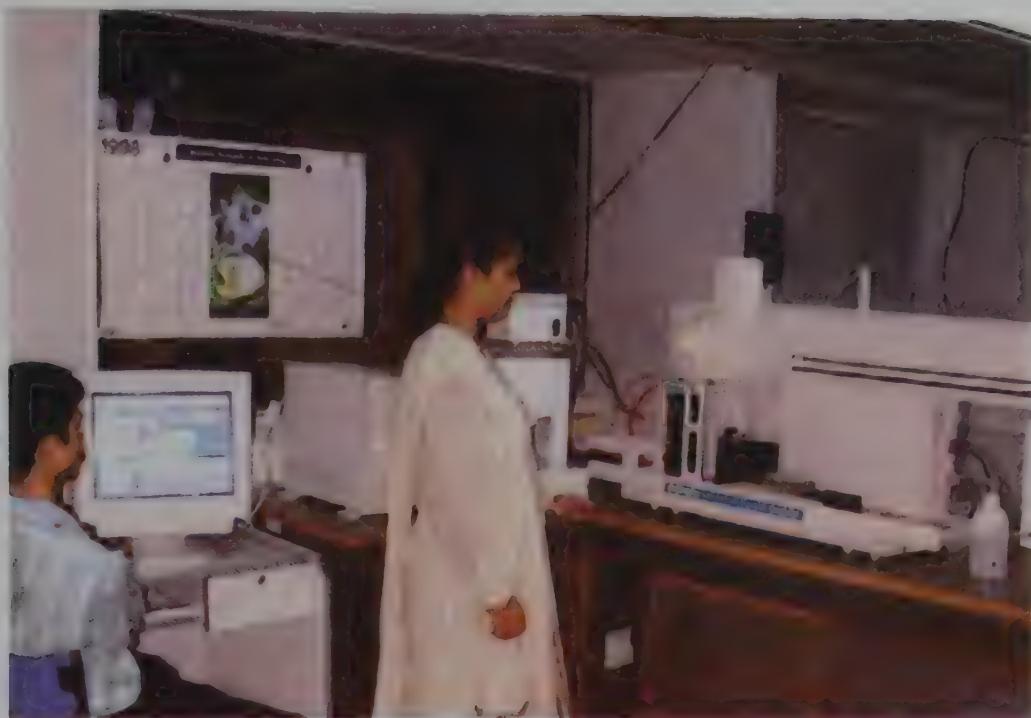
- ★ The Centre is a pioneer in the country for manufacture and supply of allergenic extracts for diagnosis and therapy of respiratory allergic disorders, studies of atmospheric biopollutants like pollen

& fungi in indoor & outdoor environment.

★ The Centre has developed new methods for safe immunotherapy. A liposome containing mite allergen has also been developed for control of allergy.

★ CBT has developed molecular diagnostics for Acute Broncho Pulmonary Aspergillosis (ABPA) and revealed the immune mechanism of the host-pathogen interaction, elucidating the role of human lung surfactant proteins A&D.

★ Expertise has been developed for synthetic gene design and expression of proteins in *E.coli* and *Baculovirus* (SINPV) Hyper producing strains of human Epidermal Growth Factor (hEGF) and



Robotic work station for genotyping

human pro insulin have been prepared in the laboratory.

❖ The Centre has developed capabilities for synthesizing modified oligonucleotides for antisense application. A universal support for oligonucleotide synthesis will provide ease of synthesis and modifications for biological research.

❖ Large quantities of custom made peptides have been synthesized by the Centre a facility for a collaborative project on "Drug discovery". It has also developed a testing facility for PCP content in leather which needs to be checked for leather exports.

❖ The Centre coordinated the All India Coordinated Project on Aeroallergens and Health sponsored by the Ministry of Environment and Forests.

❖ Waste management through aerobic digestion has been demonstrated using municipal market wastes. This process has been upscaled at Delhi Energy Development Agency (DEDA) Energy

Complexes. Sulabh International, an NGO, has been instrumental in taking this technology from Lab to Land.

❖ A process for the preparation of immobilized microbial composition, useful as a tool to use seed inoculation in BOD analysis has

been developed and patented internationally.

❖ CBT has been recognized as a test laboratory by the Department of Environment and Forests for testing samples related to environmental pollution.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

❖ Technology for preparation of Dimethoxy Triethyl Chloride and 1H-Tetrazole essential components of oligonucleotides synthesis

❖ Methodology for preparing hyaluronic acid of high molecular weight from rooster combs, used in ophthalmic surgery

❖ Fourteen clinical diagnostic kits, conforming to international standards, for estimation of different parameters of body fluids

❖ Technology for the preparation of indigenous allergenic extracts for diagnosis and immunotherapy of respiratory allergies in patients



Informatics Laboratory



Nodulation in Peanut (*Arachis hypogaea*) through Lectin-Rhizobia Interaction



Increased killing of a fumigatus spores by macrophages in presence of SP-A and SP-D

- ★ Biosensor for quantitative glucose estimation has been developed in collaboration with NPL.

TECHNOLOGIES READY FOR TRANSFER

- ★ Cloned hEGF & human pro insulin gene
- ★ Diagnostic kit for detection of Acute Broncho Pulmonary Aspergillosis (ABPA)
- ★ Universal support for oligonucleotide synthesis
- ★ BODSEED for BOD estimation in industrial effluent (waste waters)
- ★ Mycobacterial antigen for diagnosis of tuberculosis
- ★ Lectin based Rhizobium identification

FUTURE PROGRAMMES

As biochemical technology enters the genomics era, The Centre is in the process of transforming itself from a singular laboratory working in the area of biochemical research to a network laboratory, leading to the for-

mation of a virtual Institute dealing in knowledge business of new biology.

To develop technological capability and to undertake advanced molecular studies to participate in the functional analysis of human genome sequence using biological samples readily available in the hospitals.

The Centre will continue to prepare and supply antigens for diagnosis and immunotherapy to clinics and patients, respectively.

Immunological tests standardized for the detection of invasive fungal diseases will be made available to public funded hospitals/clinics.

Technologies developed for pollution control and waste management will be made available to the concerned ministries/industries for necessary implementation.

DNA-based diagnostics will be developed for use in clinics and hospitals. Development of functional genomics technology

Genome Informatics

Nucleic acids and peptide-based diagnostics

Invasive/non-invasive delivery systems

Vectors for regulated expression of gene products

Pseudo-affinity chromatographic methods for the separation of biomolecules

Biosensors for various diagnostic applications and pollution control in collaboration with NPL

Projects related to immunology & molecular genetics of respiratory disorders including allergy, fungal infections and predisposition to asthma

Molecular genetics of neurological disorders and functional significance of repetitive sequences in the genome

Development of molecular markers for pathogenic organisms, including *Mycobacterium tuberculosis*

Molecular recognition/interaction studies

Design and synthesis of modified oligonucleotides for antisense & gene targets

Design, synthesis and structural studies of peptides with a role in neurological function & dysfunctions

SPECIAL FACILITIES

Protein sequencing, peptide and DNA synthesis facility

Large scale protein purification facility

Automated DNA sequencing & genotyping facility

SERVICES OFFERED

The Centre has the National Facility for Biochemicals and Genomic Resources (NFBGR) as a repository of technical data of biochemicals required in biological research & as resource centre for biochemicals, molecular biologicals, genomic material & consumables required for biological research.

Supply of antigens for diagnosis & immunotherapy.

Testing of biological samples for various biochemical & microbiological parameters.

TRAINING PROGRAMMES

CBT in collaboration with Vallabhbhai Patel Chest Institute (VPCI), Delhi, conducts workshops twice a year to train physicians in the field of allergy and immunotherapy. About 60 M.Sc. students from various universities and research insti-

tutes in the country, are trained annually at CBT on different techniques of modern biotechnology.

The Centre conducts research and academic programme some leading to M.Sc. - Ph.D. courses in Biomedical Sciences jointly with Delhi University. CBT scientists have been recognised as Ph.D. guides by Delhi University.

CBT has signed MoU with All India Institute of Medical Sciences

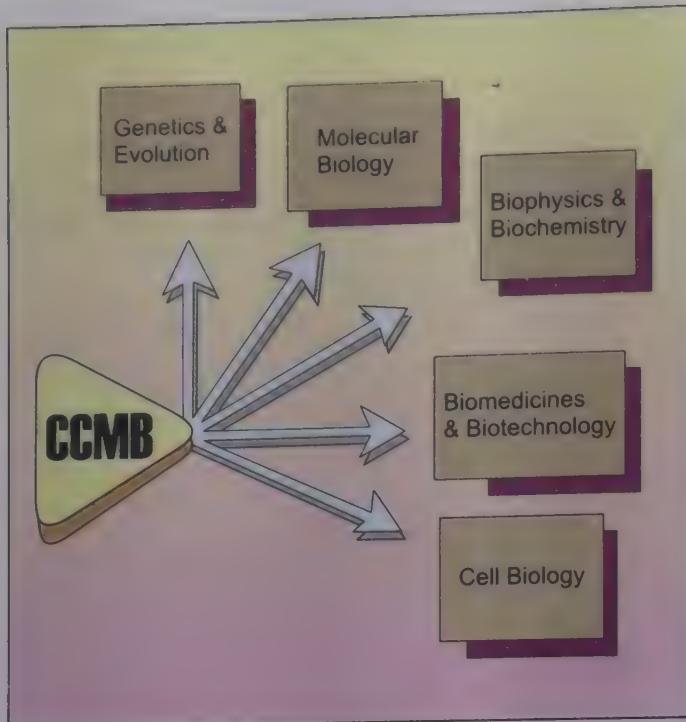
(AIIMS), Delhi and National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore for collaborative research.

The Centre trains students, teachers and scientists from other universities/institutions in various modern techniques in biotechnology.

PUBLICATIONS

Annual Report.

CONTACT PERSON: Director



Centre for Cellular & Molecular Biology (CCMB)

Uppal Road, Hyderabad 500 007

Telephone: 7172241-50;

7170130-39

Telegram: BIOCENTRE HYDERABAD

Fax: 7171195

E.Mail: lalji@ccmb.apnic.in

STD Code: 040

Established: 1977

Director

Dr Lalji Singh

Grant

1998-99

Rs.1700 Lacs

Manpower

Scientific & Technical: 165

Total: 410

MANDATE

- To conduct research in frontier and multidisciplinary areas of modern biology and to seek potential applications of this work
- To carry out exploratory work for the development of modern biochemical and biological technologies in the country

MAJOR R&D PROGRAMMES

Biomedicine & Biotechnology

Genetics & Evolution

Cell & Developmental Biology

Molecular Biology and Biochemistry and Biophysics.

SIGNIFICANT ACHIEVEMENTS

★ Epithelial cell behaviour: It has been found that vaginal epithelial cells undergo programmed cell death upon exposure to estradiol. This process is different from apoptotic mode of cell death. It has been shown that regulation of bcl-2 gene expression is one of the main causes for this difference. The studies also demonstrated the presence of estradiol binding pro-

teins on the plasma membrane of rat vaginal epithelial cells.

MOLECULAR BIOLOGY

★ Delineation of a region of the lamin A proximal promoter, which is essential for the activation of the gene in differentiated mammalian cells has been completed.

★ The Centre has identified a 60 kDa nuclear pore protein that is required for protein transport into the nucleus. This protein is observed to be specifically phosphorylated at serine/threonine residues during mitosis in cultured fibroblast cells and is rapidly dephosphorylated upon release of cells from mitosis into the G1 phase of the



Histological, FISH and PCR analysis of XXY female

cell cycle, concomitant with the re-assembly of the nuclear envelope.

- ❖ Studies on transcription have shown that under nutritional stress, *E.coli* exhibits an adaptive facility termed the "stringent response" that involves, *inter alia*, the negative regulation of rRNA synthesis that is mediated by ppGpp - a nucleotide analog known as stringent factor.
- ❖ A nuclear protein tyrosine phosphatase PTP-S2, discovered at the Centre shows transient increase in expression upon mitogenic stimulation of cells *in vitro* and *in vivo* and it increases the rate of proliferation of HeLa and fibroblast cells. These observations suggest that PTP-S2 is a regulator of cell proliferation.

BIOCHEMISTRY AND BIOPHYSICS

- ❖ Defective protein folding, the molecular basis for numerous human diseases is still a major problem. The data suggest that protein folding *in vivo* is indeed an assisted process requiring molecular chaperones. CCMB has made significant contribution to the understanding and enhancement of the chaperone-like activity of alpha-crystallin that is present in brain, heart and eye lens.

❖ Serotonergic signals have been shown to play an important role in the regulation of alcohol intake, preference and dependence. The effects of various alcohols on agents and antagonist binding of bovine hippocampal 5-HT 1A receptor have been studied and the results show that alcohols inhibit the binding of specific agonist and antagonist to bovine hippocampal 5-HT 1A receptor, both in native as well as in solubilized membranes.

❖ Modelling spatially-extended systems using coupled map lattice (CML) systems: CML systems with different forms of local dynamics show that nearest-neighbour coupling can influence the local dynamics considerably.

WILD LIFE MANAGEMENT

❖ Genetic diversity in Indian big cats: Studies have shown that Asiatic lions and tigers have much higher degrees of polymorphism than reported previously by a group of American scientists. Randomly Amplified Polymorphic DNA (RAPD) analysis of 38 Asiatic lions, which exist as a single

population in the Gir Forest Sanctuary in India has shown an average heterozygosity of 25.8% with four primers. Sperm motility studies carried out on these lions at CCMB corroborates this finding. A similar study carried out on 22 Indian tigers has shown a heterozygosity of 22.65%.

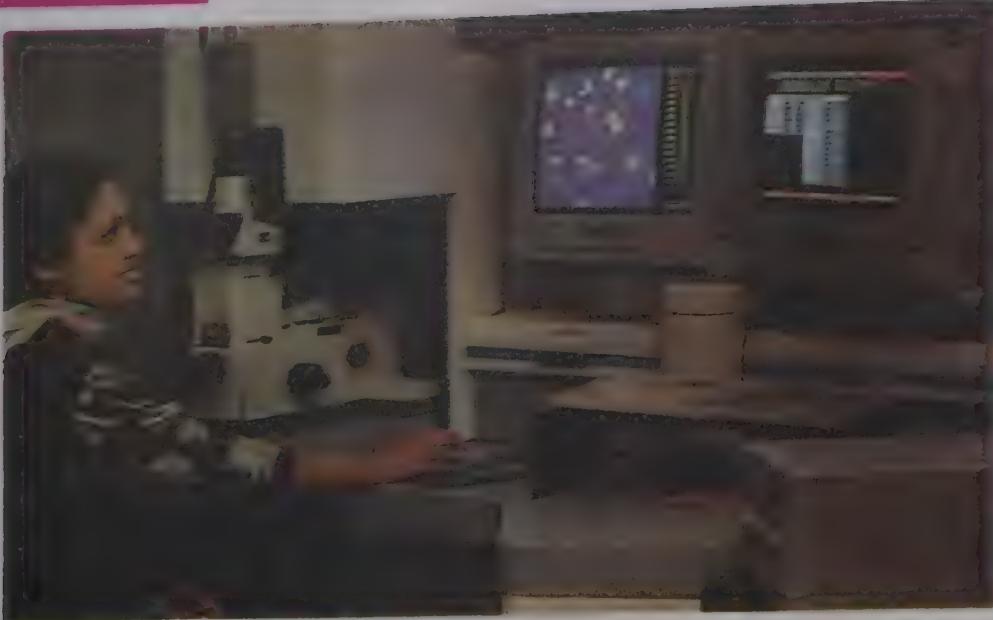
❖ Fertility status of lions, tigers and leopards in India: The Centre has undertaken a project to establish the fertility status of the lions, tigers and leopards in India in order to ascertain the decrease in population. Work was planned on captive cats from Indian Zoos to establish the fertility status initially of male cats based on semen profiles and hormonal levels. 21 tigers, 8 lions and 15 leopards were studied. The results show that animals are normal and can be used for breeding.

INTERACTION WITH INDUSTRY

The Centre through technical advice and consultation helped M/s. Shantha Biotechnics Pvt. Ltd., Hyderabad to upgrade its laboratory scale tech-



Collection of Semen samples from a tiger



National facility for confocal microscopy

nology for development of a vaccine to large scale production. The lab. also helped Dr. Reddy's Research

Foundation through two specific technology tie ups. The Centre has passed on the technology for an en-

zyme inhibitor to M/s. Genei, Bangalore. Recently CCMB in collaboration with M/s EID Parry India Limited started a project to standardise PCR based markers for distinguishing the parental and hybrid lines of rice.

SPECIAL FACILITIES

Confocal Microscopy facility

Automated DNA Sequencing facility

Flow cytometry facility

Protein analysis and peptide and DNA synthesis facilities

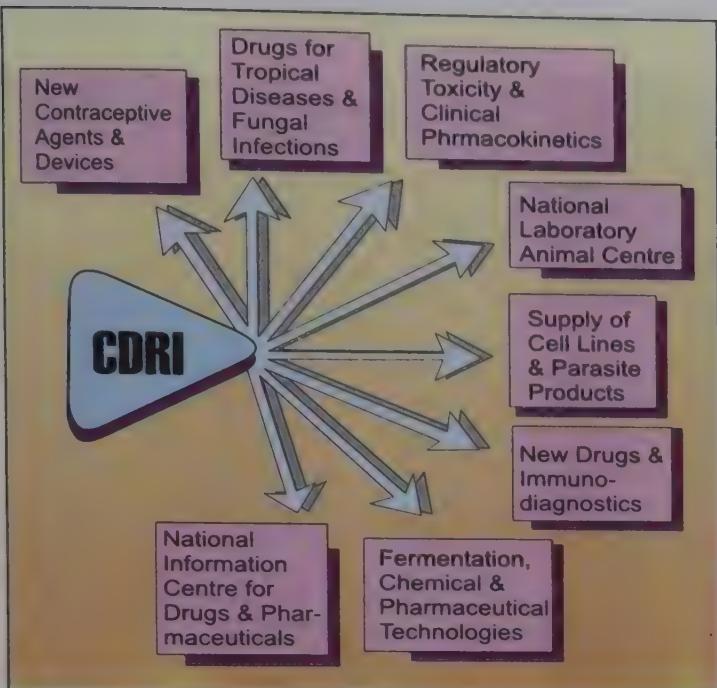
Laboratory animal facility

PUBLICATIONS

Annual Report

CCMB Highlights (monthly).

CONTACT PERSON: Director



Central Drug Research Institute(CDRI)

Chattar Manzil Palace,
Lucknow 226 001

Telephone: 214219, 223286
Telegram: CENDRUG, LUCKNOW
Fax: 223405/223938
E.Mail: cdrilk@sirnetd.ernet.in
STD Code: 0522
Established: 1951

Director
Dr C.M.Gupta
Grant
1998-99
Rs.2490 Lacs
Manpower
Scientific & Technical : 195
Total : 840

MANDATE

- To develop new drugs and immunodiagnostics
- To develop technology for drugs, intermediates and products
- To develop contraceptive agents and devices
- To conduct basic biomedical studies to understand disease processes and reproductive physiology
- To do systematic evaluation of natural resources for lead identification

MAJOR R&D PROGRAMMES

- ★ New contraceptives
- ★ New drugs for tropical diseases (malaria, filariasis, leishmaniasis and tuberculosis)
- ★ Cardiovascular and central nervous system disorders
- ★ Liver disorders
- ★ Wound healing
- ★ Osteoporosis
- ★ Fungal infections
- ★ Diagnostics for early diagnosis of malaria, leishmaniasis and tuberculosis

★ Exploration of terrestrial plants, including Indian traditional remedies, and marine flora and fauna for novel molecules for drug development

★ Development of chemical/fermentation products

★ Basic research on biology of reproduction, hostpathogen biochemical mechanisms, regulation of CVS and CNS functions, enzymes and receptors to obtain 'new leads' for drug development.

SIGNIFICANT ACHIEVEMENTS

- ★ Development of 9 new drugs/ products: Centchroman, non-



Arteether injectable for treatment of *P. falciparum* malaria (resistant, complicated and cerebral)

steroidal oral contraceptive for females

• a/B-Arteether, antimalarial blood schizontocide

• Centbutindole, neuroleptic

• Centpropazine, antidepressant

• Gugulipid, hypolipidemic

• Centbucridine, local anaesthetic

• Chandonium iodide, neuromuscular blocking agent

• Isaptent, cervical dilator for medical termination of pregnancy

• Leishmaniasis Diagnostic Kit for early diagnosis of disease.

• Development of standardized fraction of active plants as drugs/herbal preparations (Gugulipid, Picroliv, Brahmi extract and Extract CT-1).

• Technology for Biocide (*Bacillus sphaericus* and *B. thuringiensis israelensis* spore toxin formulation), mosquito larvicide for vector control.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

• Centchroman marketed under the trade names Saheli and Centron.

• Gugulipid marketed under the trade name Guglip.

• Isaptent marketed under the trade name Dilex-C.

• Centbucridine marketed under the trade name Centoblok.

• Leishmaniasis diagnostic kit marketed under the trade name Leishma Test.

• Fermentation technology of 1-Ephedrine hydrochloride; 1-Ephedrine hydrochloride and pseudoephedrine; and 1-Acetyl-phenyl carbinol.

• Chemical technology of Primaquine; Acyclovir; Dextropropoxyphene hydrochloride; Pyrithioxin

TECHNOLOGIES READY FOR TRANSFER

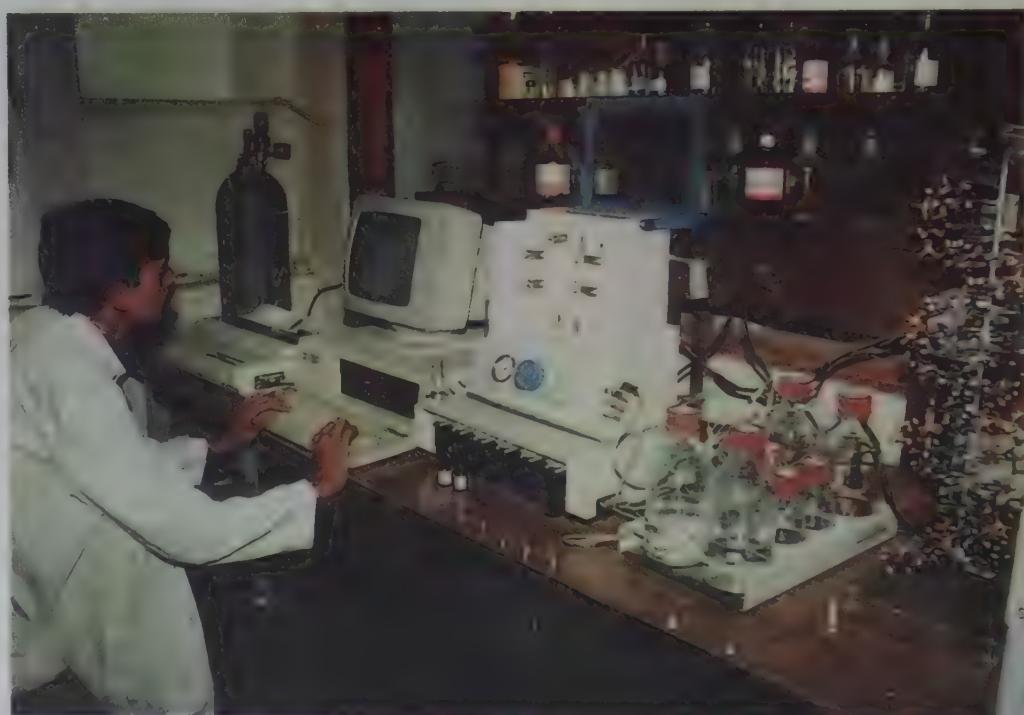
• Biocide, mosquito larvicide

• Centchroman, anticancer breast

• Compound 81/470, broad spectrum anthelmintic for veterinary and medical use

• Consap, a spermicidal cream, for use as local contraceptive

• Compound 80/53, antirelapse antimalarial



Automated DNA synthesizer



Pilot fermenter facility



200 MHz NMR with auto sample changer unit

- Compound 80/574, hypolipidemic
- LDH-based diagnostic kit for malaria
- Lactic acid

FUTURE PROGRAMMES

Development of new drugs and diagnostics in priority areas of national health and knowhow for their commercial production besides focussing on internationally important areas namely wound healing, gastric ulcer, hepatoprotection, ageing disorders (osteoporosis, diabetes, memory loss, hypertension), fungal infections and tuberculosis.

SPECIAL FACILITIES

Sophisticated instrumentation facilities and electron microscopic study
Computer aided drug design
Biological screening in about 170 in vitro/in vivo test systems

Regulatory pharmacology, pharmacokinetics, toxicology and clinical trials

Fermentation studies

Animal House

SERVICES OFFERED

Consultancy in technology upscaling of drugs and development of laboratory animal facilities; Contract research as sponsored, collaborative and grant-in-aid projects.

Analytical and testing services to academia and industry and supply of laboratory animals including specific pathogen-free (SPF) animals, cell lines and parasite products.

The National Information Centre for Drugs & Pharmaceuticals with access to international databases to cater to information needs.

TRAINING PROGRAMMES

Short-term training in techniques in drug research; regular training course in laboratory animal science.

PUBLICATIONS

Annual Report, Drug Research Perspective Series and brochures.

CONTACT PERSON: Director

Data Stations/extension Centres:

Neuropharmacology Unit,

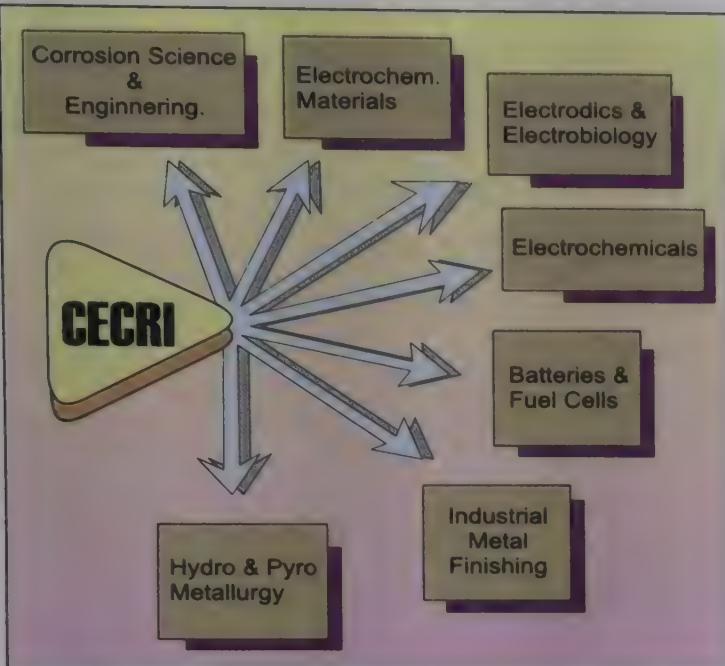
K.G.'s Medical College,

Lucknow

Clinical Pharmacology Unit,

K.G.'s Medical College, Lucknow

Clinical Pharmacology Unit,
Seth G.S. Medical College & KEM
Hospital, Parel, Mumbai



Central Electrochemical Research Institute (CECRI)

Karaikudi 630 006

Telephone: 22064 & 22065
 Telegram: CECRI KARAIKUDI
 Fax: 4565-22088
 E-Mail: ragha@cscecri.ren.ni.in
 STD Code: 04565
 Established: 1953

Director
 Dr M.Raghavan
Grant
 1998-99
 Rs.1360 Lacs
Manpower
 Scientific & Technical: 545
 Total: 630

MANDATE

- To conduct research in different areas of electrochemistry and allied fields
- To develop new processes and products in the areas of its specialization
- To contribute to human resource development by imparting university-level courses in electrochemical engineering and technology and refresher courses in corrosion prevention, industrial metal finishing, batteries, etc.

MAJOR R&D PROGRAMMES

- ★ Batteries and power sources
- ★ Corrosion science and engineering
- ★ Electrochemicals
- ★ Electrochemical materials science
- ★ Electrohydrometallurgy
- ★ Electropyro-metallurgy
- ★ Electrochemical instrumentation
- ★ Electrodics
- ★ Electrobiology

★ Industrial metal finishing

★ Basic research also forms an important part of the R&D programmes

SIGNIFICANT ACHIEVEMENTS

- ★ Technologies for making Lead-Acid Batteries - normal and low temperature applications, maintenance free and deep discharge
- ★ Know-how for Magnesium batteries - magnesium silver chloride and magnesium cuprous chloride

- ★ Know-how for nickel-iron battery.
- ★ Process technologies for cathodic protection of any structure by sacrificial or impressed current systems. Know-how for supervisory control and data acquisition systems for automatic corrosion monitoring and corrective measures by remote control for off-shore structures. Know-how for monitoring of corrosion of bridges. Know-how for several corrosion inhibitors for any RCC construction.

Technologies Process for:

- Titanium Substrate Insoluble Anodes (TSIA).
- Membrane Cell for chlor-alkali production.
- Energy efficient production of potassium perchlorate, potassium iodate, calcium gluconate, manganese dioxide, daylight phosphors.
- Production of sodium metal, chromium metal and powder, gallium recovery from Bayer liquor.
- Plant scale anodizing, plating, bath concentrates for Pt, Pd and selective high speed and decorative gold plating; copper plating and colour coating of stainless steel.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Titanium substrate insoluble anode (TSIA).
- ★ Zinc ethyl silicate primer and SRHS chrome salt.
- ★ Copper plating/colour coating of stainless steel vessels.
- ★ Al-Zn-In and Zn-Mg sacrificial anodes.
- ★ Ion-selective electrodes.
- ★ Magnesium cuprous chloride battery, magnesium silver chloride battery, lead-acid battery, maintenance-free lead-acid battery and



Automatic battery tester



Concrete coating monitor



Nickel electroform cryogenic C1 rocket engine with manifold attachment

- paste type deep-discharge lead-acid battery.
- ★ Calcium gluconate, potassium iodate, potassium chlorate, calcium carbide and ammonium perchlorate production.
- ★ Membrane cell for the production of potassium hydroxide and sodium hydroxide.
- ★ Electroforming of engineering components.
- ★ Electrophoretic paint; blue phosphor
- ★ Anti-corrosive treatment for steel reinforcement rods.
- ★ Chromium and sodium metals production.
- ★ Rust converter.
- ★ Selective high speed gold and decorative gold plating.
- ★ Perchloric acid production.
- ★ Yellow chromising solution for aluminium.

- ★ Sulphur concrete technology for rapid repair of damaged concrete structures
- ★ Cement polymer coatings
- ★ Paint formulations (Epoxy - polyurathene) for concrete structures
- ★ Disposable silver-silver chloride electrode for ECG.



Diamond powder incorporated metal matrix composite coatings on steel discs

TECHNOLOGIES READY FOR TRANSFER

- ★ Technology packages consisting of project preparation, assistance for plant machinery procurement, plant erection and commissioning for:
 - Sodium and potassium chlorates; sodium, potassium and ammonium perchlorates, calcium gluconate
 - Electrolytic manganese dioxide, magnesium and chromium metals
 - Anticorrosive treatment for steel reinforcement rods in RCC
 - Lead-acid batteries -normal temperature operation, low-temperature operation, maintenance free and deep discharge
 - Aluminium and its alloy finishing - anodizing, hard anodizing, and AC anodizing
 - Pd and Au plating solution concentrates
 - Membrane cell for production of NaOH/KOH
 - Cement Polymer coatings
 - Protective coating systems for steel structures in chlor-alkali industries
 - Air drying synthetic enamel paint
 - Sulphur concrete technology for rapid repair of damaged concrete structures
 - Epoxy powder for aqueous powder suspension coating
 - Chloro toluenes
 - Disposable Silver-Silver chloride electrode for ECG

- Yellow chromating solution for Aluminium
- ★ Processes/Knowhow for preparation/fabrication with basic engineering design:
 - Perchloric acid
 - Potassium iodate
 - Magnesium-silver chloride sea water activated batteries
 - Cupric, silver and chloride ion-selective electrodes

FUTURE PROGRAMMES

Development of energy-efficient technologies for production of metals and chemicals, protection of materials and structurals; high-energy density storage, and pollution monitoring & control. Preparation of novel materials finding application in con-



Electrochemical fluorination cell

version of solar energy, communication and medical diagnosis. Sponsored/Collaborative R&D work in the areas of corrosion, metal finishing, metallurgy, intermediate chemicals, etc.

SPECIAL FACILITIES

Modern analytical facilities like high performance liquid chromatography, gas chromatography, gel permeation



Electroforming facility for producing cryogenic engine

CECRI

chromatography, IR, UV and atomic absorption spectrophotometers, X-ray powder diffractometer, scanning electron microscope, and elemental analyzer.

A betatron radiographic instrument for monitoring corrosion in reinforced and prestressed concrete structures.

Battery Testing (Chennai Unit)

SERVICES OFFERED

Surface preparation and painting of industrial steel structures and RCC structures of bridges

Monitoring condition of bridges, oil pipelines

Survey and design of cathodic protection system for oil pipelines, offshore platform, cooling water system

Suitable inhibitors, biocides, anti-scalants for cooling water system

Setting up Anodising plants and various plating plants of any capacity

Custom built electrochemical electronic instruments like Battery life cycle tester, pinhole detector, Potentiostat

Modernisation of Battery Plants

Trouble shooting in battery and plating industry

Pollution analysis at ppb level with suitable recommendations

TRAINING PROGRAMME

Technology-oriented refresher courses in the areas of batteries, corrosion prevention, metal finishing and pollution control, and training courses for industries, R&D organizations and educational institutions.

PUBLICATIONS

Annual Report, Bulletin of Electrochemistry (Monthly), CECRI News

(Bimonthly), Battery Newsletter (Bi-monthly), STED Newsletter.

CONTACT PERSON: Director

Field Stations/extension Centres:

CECRI Madras Unit

CSIR Madras Complex, TTTI

Taramani, Chennai 600 113

Telephone:044-2352066,2352456

CECRI Cochin Unit

Industrial Development Plot

Kalmassery (South), Ernakulam 683109

Telephone:0484-532958,542245

Fax:0484-542513

CECRI Corrosion Research Centre
Mandapam Camp 635519,Ramnad
District (TN)

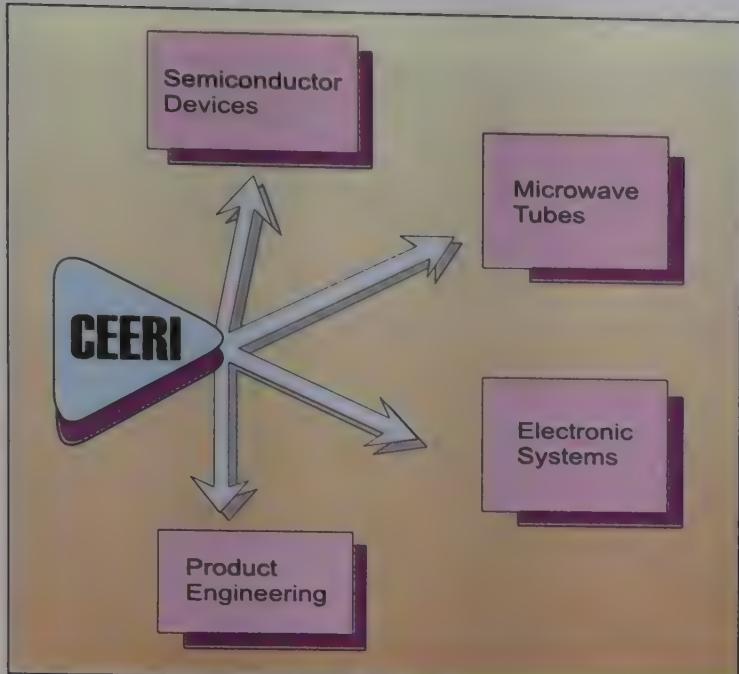
Telephone:04573-41462

CECRI Tuticorin Unit

Harbour Area, Tuticorin 628004

Telephone:0461-52546

Telex:0434-243 TPT IN



Central Electronics Engineering Research Institute (CEERI)

Pilani 333 031

Telephone: 42111,42133
 Telegram: ELECTRONIC PILANI
 FAX: 42294
 E-Mail: rnb@cecri.ernet.in
 STD Code: 01596
 Established: 1953

Director (Acting)

Dr S. Ahmed
Grant

1998-99

Rs.1480 Lacs
Manpower

Scientific & Technical:180
 Total:650

MANDATE

- To carry out R&D in electronic devices and systems
- To assist industry in technology absorption, upgradation and diversification
- To provide R&D services to industry and users in design, fabrication and testing
- To provide technical services for specific needs towards product development.

MAJOR R&D PROGRAMMES

- Microwave tubes, semiconductor devices and electronics systems. In Microwave Tubes with focus on the development of high power tubes for microwave and industrial applications. In semiconductor devices, projects on hybrid microcircuits, IC design, microelectronic technology, microwave devices, opto-electronic devices, power devices, sensors & microsystems. In Electronic systems the focus is on development of electronic in

strumentation and control systems for agro-based industries, communication engineering, digital systems, industrial electronics, information technology, instrumentation systems and speech technology.

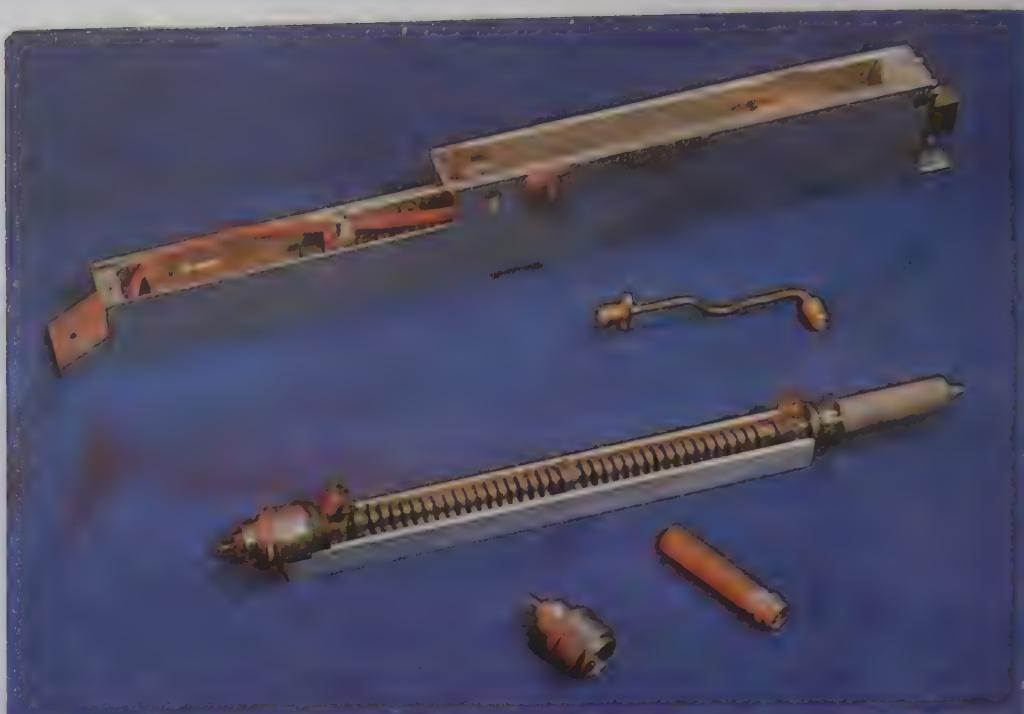
SIGNIFICANT ACHIEVEMENTS

- Design and Development of 5 MW, S-band Klystron
- Successful Performance of Broad Band Mini-TWTs in Pulsed Mode



2-MW Pulsed tunable magnetron

- ❖ Space qualification hybrid micro-circuits for ISRO
- ❖ 2 Watt C-band high power GaAs MESFETs
- ❖ Development of 30W (CW) TWT, 2MW S-band magnetron, high current density cathodes
- ❖ Optical receivers for long haul optical communication systems
- ❖ GaAs/InP PIN detectors
- ❖ Silicon microchannel heatsink for high power laser sources
- ❖ 1 GHz silicon microwave transistor
- ❖ Design of Serial data controller Chip
- ❖ 3-micron CMOS N-well process technology
- ❖ Application of New materials for sensing ammonia and nitrogen oxide gases at room temperature
- ❖ Laboratory model of 2X35 kVA DC Drive for Mining loco and Laboratory prototype of electric vehicle
- ❖ Feasibility study of integrated performance index evaluation system for Sugar Industry
- ❖ NICAM Receiver for stereo sound in TV
- ❖ GRAMNET - A GIS Tool for infrastructure planning and
- ❖ Development of PC-based Control System for rapid thermal processing(RTP) System



Gain and phase matched mini TWT



High power GaAs MESFET

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ❖ S-band, 30W TWT
- ❖ 500 VA UPS
- ❖ Zirconia Oxygen Analyser
- ❖ Microprocessor Based Pan Monitoring and Control System(MIP-MOS)
- ❖ PC-based digital data capture system for photogrammatic applica-

tions and Technology on Pan Automation System.

TECHNOLOGIES READY FOR TRANSFER

- ❖ S-band, 2MW Magnetron
- ❖ 155 Mbps hybrid PINFET optical receiver; 2 Watt C-band GaAs MESFET
- ❖ Silicon varactor diodes for TV tuners



Low cost heat sinks for high power semiconductor lasers



Locomotive speed recording instrument

- ★ Digital Co-ordinate capture system (PECK-22)
- ★ Automatic drip irrigation system
- ★ PWM actuating amplifier
- ★ Locomotive speed recording instrument
- ★ Desuperheated system temperature controller for sugar industry
- ★ Speech secrecy system(SECRA-PHONE)
- ★ NICAM Receiver for stereo sound in TV and Monitoring and control

of withering process for Tea Industry

FUTURE PROGRAMMES

Limited series production of GPMT TWT in collaboration, with BEL; design and development of 200 kW gyrotron; S-band co-axial and C-band magnetrons; collaborative project with FZK, Karlsruhe on design of gyrotrons; PIN/FET front end optical receiver; C-band high power GaAs MESFETs; power devices; design of

advanced architecture microprocessor chip; design of application specific VLSI processors and architectures; development of real-time on-line intelligent sensors and transmitters for core-sector industries such as sugar, tea, mushroom, paper, textile, rubber, leather, etc. and application of adaptive and neuro-fuzzy controller techniques for these industries; development of diagnostic and control systems for diesel and electric locomotives; PROFIBUS compatible smart transmitter for industrial applications; fabrication of smart sensors for temperature, pressure and humidity measurements; voice operated machines; GIS for industrial applications; and digital audio broadcasting receivers to replace FM radio receivers.

SPECIAL FACILITIES

Computer-aided design (CAD) of ICs, discrete semiconductor devices and microwave tubes

Fabrication facility for semiconductor devices and microwave power tubes

SERVICES OFFERED

Consultancy services for design, up-gradation and absorption of technology; contract research on specific problems and requirements of electronic industry.

PUBLICATIONS

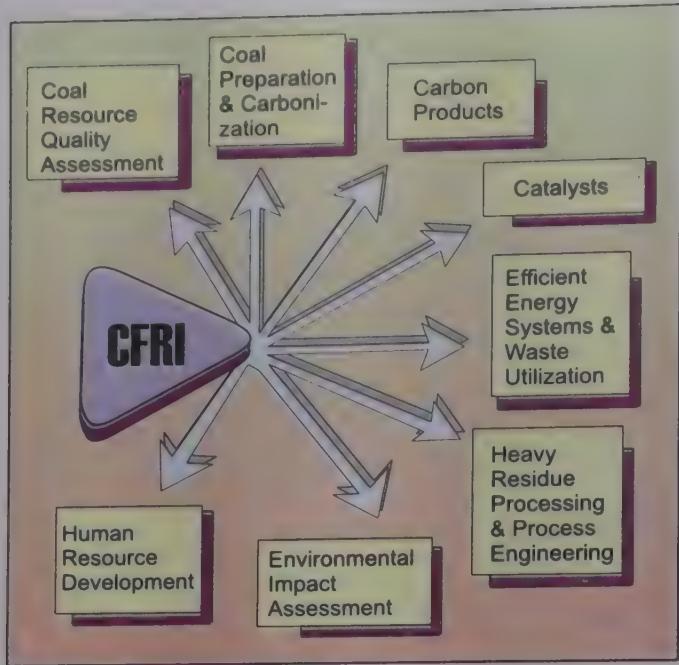
Annual Report, CEERI Newsletter (quarterly)

CONTACT PERSON: Director

Field Stations

CEERI Delhi Centre
CSIR Complex, NPL Campus
New Delhi 110012
Telephone: 5784642
E-Mail: asld@cecrid.ernet.in
Telegram: CEERICENT

CEERI Chennai Centre
CSIR Complex, Taramani
Chennai 600113
Telephone: 2352281
PABX: 2351901, 2352430
Telegram: CONSEARCH



Central Fuel Research Institute (CFRI)

Dhanbad 828 108

Telephone: 460141, 461710
 Telegram: RESEARCH, FRI DHAN-BAD
 Fax: 464350
 E.Mail: cfri@sirnetd.ernet.in
 STD Code: 0326
 Established: 1946

Director (Acting)

Dr Kalyan Sen

Grant

1998-99

Rs. 1600 Lacs

Manpower

Scientific & Technical: 220

Total: 825

MANDATE

- R&D centre for technology development and transfer by forging strategic alliance with other agencies
- To generate basic knowledge, innovation and advanced concepts in science and technology for economic, efficient and environmentally safe fuel utilisation and management.

MAJOR R&D PROGRAMMES

- ★ Improving efficiency in power generation by employing efficient power generation cycles and co-generation system
- ★ Augmenting the production of better quality indigenous reductants for steel making and other metallurgical purposes
- ★ Developing coal-based industrial carbons of different specifications
- ★ To gain deeper insight into the structure of coal for its efficient utilization/conversion
- ★ To reduce dependence on petroleum products through conversion of coal/organic wastes into synthetic fuel and other chemicals/feed stocks

- ★ To promote the changeover from non-commercial firewood, domestic fuel, to commercial ones particularly in rural areas
- ★ To develop pollution control measures for coal-based industries
- ★ To evolve national standards
- ★ To carrying out national task of resource quality assessment in alliance with coal producing industries
- ★ To carrying out energy audit.

SIGNIFICANT ACHIEVEMENTS

- ★ The institute has acquired the ISO 9001 certification.
- ★ CFRI technologies are in use in all the 22 existing central washeries



Batch rotary breaker

(with installed capacity 38 million tonnes of coal per year), and upgradation of high ash Indian coals by beneficiation to augment coking coal reserves in the country

- ❖ Selection of optimum coking blends for steel plants, characterization of available coking coals, commissioning of coke oven batteries, development of improved designs for beehive coke ovens (non-recovery type) and standardization of specifications and testing of coke for BIS
- ❖ Development of solvent refined coal (SRC), a coking additive, from non/weakly-coking coals that would help reduce prime coking coal component or imported coal blends in the coke ovens of steel plants

❖ Chemical desulphurization of coals with high sulphur content

❖ Beneficiation study on lignite desulphurisation

❖ Process development of indigenous sand for caking index and reactivity of coke/char, development of carbon molecular sieve for gas separation, utilization of low-ash metallurgical coke (LAMC) as heating medium in the production of synthetic graphite and substitution of electrically calcined anthracite by LAMC for alumina reduction cell.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ❖ A series of zeolite catalysts for the production of industrial chemicals



3.5 KW Fluid bed pilot plant

- like 2-, 3-, & 4- Picolines and pyridine
- Modified, new generation catalysts for synthesis of olefins and liquid fuels from syngas
- Process for making bricks using fly ash, sand and lime
- Improvement of tar/pitch for use as binders for basic refractory bricks
- Conversion of 3-cynopyridine to nicotinamide
- Development of coke/coal-based efficient domestic chullhas.

FUTURE PROGRAMMES

Assessing and improving the performance of existing washeries; development of environment-friendly and thermally-efficient beehive coke ovens; use of coal-water slurry as an alternative to liquid fuels; generation of newer concepts through unification of existing schools of thought relating to coal structure and development of global indices for proneness and safety limits of oxidation, weathering and spontaneous fire of coals; cogeneration potentiality from fuel gas of non-recovery ovens, standardisation and coal quality monitoring of washery despatches; processing of heavy residue and high alcohols from synthesis gas.

SPECIAL FACILITIES

Pilot and test facilities for briquette curing plant; Catalyst test unit for conversion of syngas to liquid fuels; CBJ hydraulic press; coal/oil stabilized slurry unit; Fischer - Tropsch process development unit; Fluid bed

hot air generator; Fluidized-bed combustor; heavy medium and Hydro Cyclone units, high-pressure hydrogenation pilot plant; high temperature graphitization furnace; hydrogen gas plant; Super centrifuge. The Institute has a wide range of modern instrumental facilities important among these are: Atomic absorption spectrometer; Automatic calorimeter; Automatic Gieseler plasto-meter; CDS micro reactor; Differential scanning calorimeter; ESR spectrometer; FT-NMR/IR spectrometers' Gas chromatograph; Haake viscometer; Heating microscope; High pressure liquid chromatographs; Inductively coupled plasma emission spectrometer; Mass spectrophotometer; Mercury porosimeter; Orthoplan-POL microscope; Semi-automatic image analyser, spectrocalorimeter; Surface area analyser; Temperature programmed desorption apparatus; UV & IR-Spectrophotometer; X-ray diffractometer, and Zeta potential analyser.

SERVICES OFFERED

CFRI serves the energy sector covering coal, steel, power, petroleum and chemicals, through assessment and development of technology, feasibility studies, and technical advice. The Institute also undertakes energy audit work.

TRAINING PROGRAMMES

The Institute conducts training courses for industry, R&D organizations and educational institutions.

CFRI has MoU with BITS Pilani for one semester PS course at ISM Dhanbad, M.Tech. (Fuel Engineering).

PUBLICATIONS

Annual Report, Fuel Science and Technology Journal
Monographs (Six)
ENERGY VISION - 2020
COAL PREPARATION
COAL CARBONIZATION
COAL CHEMICALS
RURAL ENERGY
BULK USE OF FLY ASH

CONTACT PERSON: Director

CFRI Units

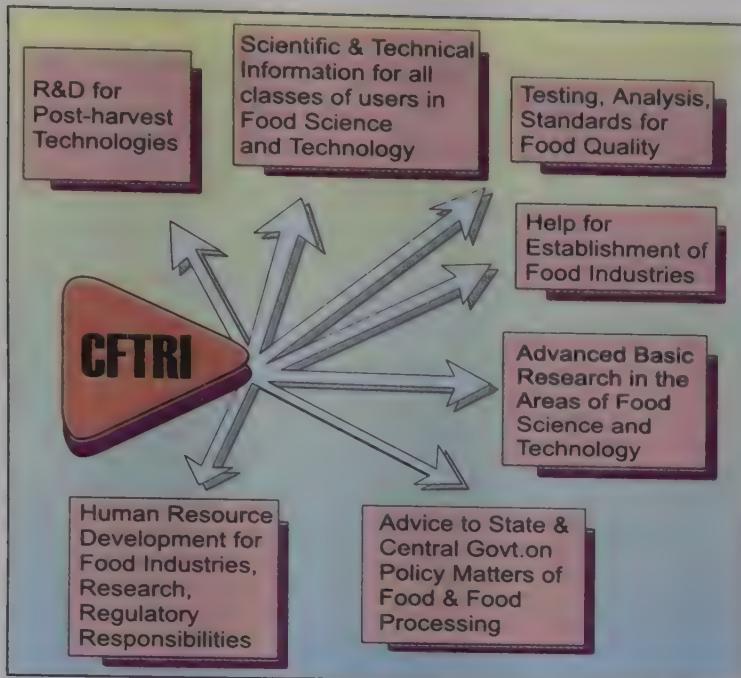
CFRI Ranchi Unit,
P.O. Namkum, Ranchi-834010
Telephone:0651-313276

CFRI Nagpur Unit
17/C Telenkhadi Area,
Civil Lines, Nagpur-440001
Telephone:0712-531319

CFRI Raniganj Unit
Bansra House,
P.O. Raniganj-713347
Burdwan (W.B.)
Telephone:0341-444195

CFRI Bilaspur Unit,
Circuit House Road,
P.O. Bilaspur-495001(M.P.)
Telephone:07752-23510

CFRI Jorhat Unit
P.O. Jorhat
Assam-6
Telephone:0376-320185



Central Food Technological Research Institute (CFTRI)

Mysore 570 013

Telephone: 517760
 Telegram: FOODSEARCH,
 MYSORE
 Fax: 516308/517233
 E.Mail: director@nicfos.ernet.in
 STD Code: 0821
 Established: 1950

Director
 Dr V. Prakash

Grant
 1998-99
 Rs. 1950 Lacs

Manpower
 Scientific & Technical: 255
 Total: 750

MANDATE

- To develop globally competitive post-harvest technologies for efficient protection, conservation and processing of agricultural produce for optimal utilization of nation's food resources
- To help increasing efficiency and productivity in food industry through development of appropriate technologies and human resources
- To develop technologies for addition of value and utility through research and development of agro resources, horticultural and plantation produce and contribute to sustained development, food security and food safety
- To design and fabricate of prototype food processing machinery
- To assist food industry; effective information service in the field of food science and technology; and human resource development in the area of food processing and conservation

MAJOR R&D PROGRAMMES

- ★ Development of food products and processes
- ★ Technology packages for convenient and ready-to-eat foods

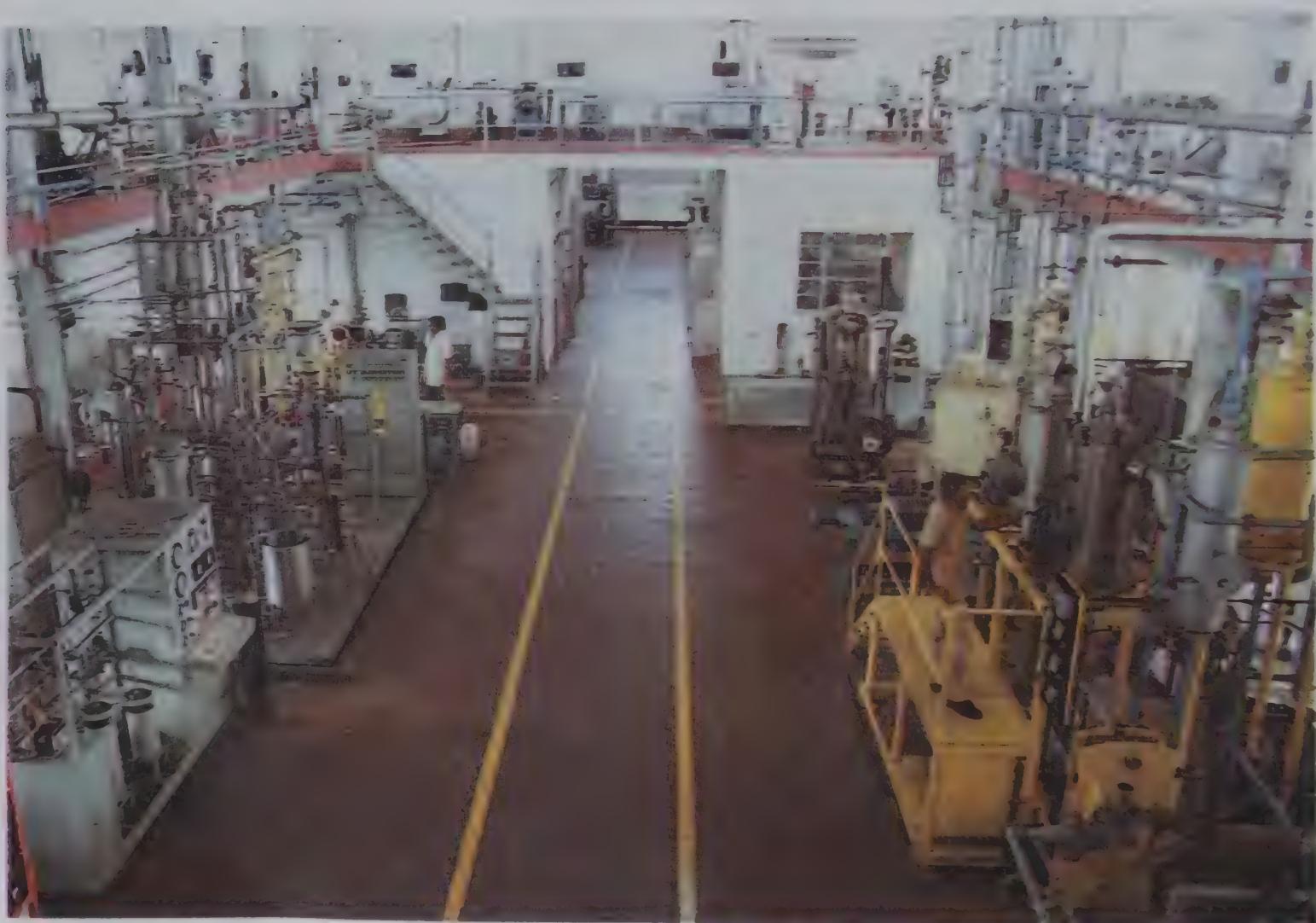
- ★ Low-cost nutritive foods for vulnerable population
- ★ Processes for value added products from plantation produce
- ★ Protocols for post harvest handling and transportation of fruits



Mango cereal flaking machine

and vegetables for export and inland shipments

- ❖ Packaging of food materials and processed food products for extended shelf-life
- ❖ Techniques for crop and grain protection
- ❖ Technologies for eliminating or reducing post-harvest losses of perishables and durable
- ❖ Modernisation of the primary food processing industry through development of energy-efficient, cost-effective machinery and equipment.
- ❖ Basic research on food additives, preservatives, micronutrients, food toxicity and safety, food mi-



Pilot plant facility



Natural food colours

crobiology and bioactive substances.

SIGNIFICANT ACHIEVEMENTS

- ★ Development of efficient processes for handling, drying and milling to avoid quality and quantity losses in rice, refinement of millets and their diversified products with enhanced nutritive value
- ★ Development of protocols, formulations, equipment and knowhow for safe food protection from the attack of insects, rodents, microbes and other pests
- ★ Designing and fabrication of energy-efficient and cost-effective machinery for milling rice, wheat, maize and pulses
- ★ Food quality and safety assurance through testing, analysis, and development of quick detection kits to monitor contaminant and toxin levels in foods
- ★ Development of cost-effective and nutritious food formulations based on plant proteins, e.g., energy food, weaning food, Miltone and food for meeting the requirements

of welfare programmes for vulnerable low-income groups

- ★ Development of value added products from plantation produce, e.g. dry green pepper, essential oils and oleoresins and their fractionation from spices for export trade; indigenous knowhow for cocoa products
- ★ Development of flavour concentrates for soft-drink industry, col

beverages, citrus fruit derived drinks, liquefied and clarified fruit juices from banana and guava

- Development of durable and shelf-stable convenience food formulations and packages for traditional popular food items.
- Development of infant food formulations using buffalo milk; knowhow for handling, grading, packing and shipping of tropical fruits of India for export trade; papad and biplate making machinery; technology for the manufacture of plant growth hormones from agricultural wastes with a 15-30% growth promotion potential; Design and fabrication of automated machines for continuous and large-scale manufacture of traditional Indian foods.
- Modernization of oilseed milling industry through development of technologies for high yield and superior quality of edible oil and utilization of byproducts
- Development of technology for rural based biotechnological production of Spirulina alga



Continuous chapati making machine

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ❖ Shelf-stable egg powder and egg white from fresh eggs; products of spices; Flavour concentrates and soft drink manufacturing technology for cola beverages, lemon and orange drinks; Food colours from plant materials; Curcumin concentrate from turmeric oleoresin for its use in cosmetics, pharmaceuticals and as a safe food colourant.
- ❖ Chitosan, a commercially valuable polysaccharide from shrimp industry waste having applications in water purification, enzyme immobilization, postsurgical nursing and textile dyeing
- ❖ Aflatoxin-free groundnut oil
- ❖ n-Triacontanol, a plant growth promoter; Integrated utilization of lime including recovering oil, citrate and pectin
- ❖ Energy food, weaning food formulations; and machinery for their manufacture
- ❖ Total technology for dehulling and extraction of superior quality oil from oil seeds.
- ❖ Free-flowing compounded asafoetida powder
- ❖ Improved designs for grain milling machinery for increased yields of milled products; Protocol for food grain protection including non-toxic grain protectants; Package for handling, grading, conserving, packaging and shipping of export-oriented tropical fruits of India.
- ❖ Ready-to-use instant mixes for traditional food products
- ❖ Total technology for manufacture of *Spirulina platensis*, the fresh water blue green algae.



Bioplates made from waste Areca leaves



Technology for making banana and guava juices

- ❖ Automatic dosa making machine, capacity 400-600 dosas per hour
- ❖ Sugar-free biscuits
- ❖ Staining technique for testing of Basmati rice
- ❖ Viable small-scale technologies for production of oyster mushroom (*Pleurotus sajorcaju*, *P. florida*),
- ❖ Total technology for manufacture of pickles veg. and non-veg. on a large scale and biryani

culture preparation, spawn production, mushroom growing and dehydration

- ★ Herbal, safe effective mosquito repellent coil

TECHNOLOGIES READY FOR TRANSFER

- ★ Design for an Automatic idli making machine with a capacity of 800-1000 idlis per hour
- ★ Compact machinery for Chapathi production (700 chapatis/hour)
- ★ Eco-friendly and cost-effective steam sterilization process for black pepper; for production of high-fibre biscuit, a health food
- ★ Protocol for preventing drip loss in frozen prawns, a highly priced export product
- ★ Improved process, design and prototype (100 kg/hour) machinery for popping.
- ★ Biotechnological production of Spirulina

FUTURE PROGRAMMES

Upgradation of technologies for production of traditional foods to achieve higher quality, efficiency and productivity

Development of novel, nutritious, cost-effective food formulations for specific groups; Bioactive compounds from plant sources; Food irradiation; Stabilization of enzymes of industrial importance; Biodegradable plastic for packaging of foods.

Design and prototypes of food processing machinery; Application of biotechnology for maximum utilization of agricultural resources; Value-

added products from horticultural/ plantation produce and processes with the main focus on pesticide and toxin-free materials

SPECIAL FACILITIES

Modern 20 tonnes/day capacity roller flour mill (Swiss make)

Research-cum-training abattoir with modern equipment; Pilot plant and workshop with an array of equipment and machinery for process scale up and study of unit operations and a functional package testing laboratory for assessing packaging materials.

Codex Nodal Laboratory for quality evaluation.

SERVICES OFFERED

Guidance for quality control; Industrial consultancy for food-based projects; Sponsored and contract research; Trouble shooting; Pilot plant production for marketing studies; Sensory assessment and market acceptance studies; Testing of packaging materials and food packaging assistance; Specialized bibliography and technology update service.

TRAINING PROGRAMMES

Short-term programmes in more than 45 specialized areas of food science and technology for industrial personnel.

A 2-year M.Sc. course in Food Technology, in Ph.D. programme and M.Sc. in Food Science by research under Mysore University.

A one-year certificate course supported by Roller Flour Miller's Federation of India and Government of Switzerland.

PUBLICATIONS

Annual Report, Food Technology Abstracts (Monthly), Food Digest (Quarterly), Food Patents (Quarterly), Techno-economic News (Monthly), CFTRI Newsletter (Bimonthly), books and monographs.

CONTACT PERSON: Director

Regional Centres

CFTRI Regional Centre
Bhavan's College Campus
Andheri(West), Mumbai-400058
Tel:(091)22- 6231599
E.Mail:anaconda@bom3.vsnl.net.in

CFTRI Regional Centre,
UPSIDC Industrial Area
Chinhat-Dewa Road,
Lucknow-227105
Tel: (091)522-818126

CFTRI Regional Centre
Uppal Road, Near IICT Campus,
Hyderabad-500007
Tel: (091)40-7171128,7151157

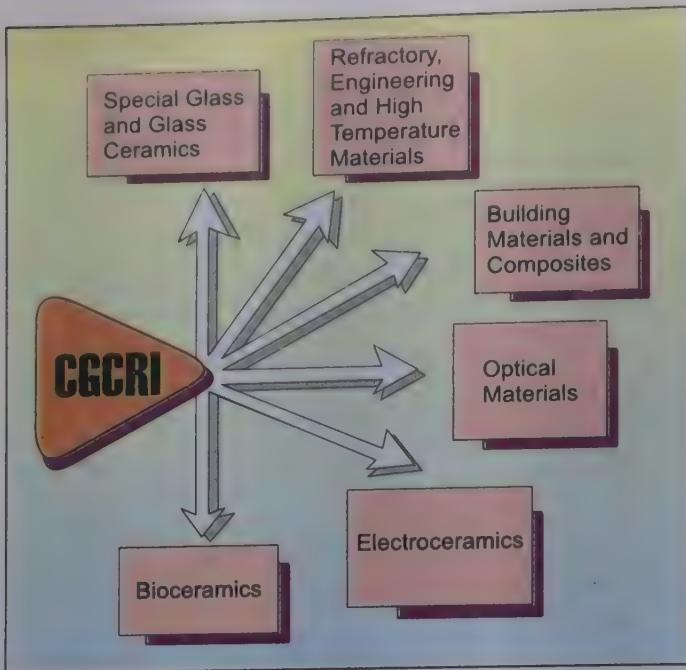
CFTRI Regional Centre
Fisheries College Campus,
Hoige Bazar, Mangalore-575001
Tel:(091)824-424304

CFTRI Regional Centre
PO Guru Nanak Engineering
College, Gill Road,Ludhiana-141006
Tel:(091)161-490568

CFTRI Regional Centre
Gole Bungalow Chhindwara Road,
Nagpur-440013
Tel:(091)712-534571

Liaison Office

CFTRI Liaison office
775, Binnamangala layout,
Double Road, Indira Nagar II Stage
Bangalore-560038
Tel:(091)80-5259931
Fax:(091)80-5286809



Central Glass & Ceramic Research Institute (CGCRI)

196, Raja S.C. Mallick Road,
Calcutta 700 032

Telephone: 4733496, 4733469,
4733476, 473347
Telegram: GLASCERCH,
CALCUTTA
Fax: 4730957
E.Mail: director@cscgcri.ren.nic.in
STD Code: 033
Established: 1950

Director
Dr H.S. Maiti
Grant
1998-99
Rs.1460 Lacs
Manpower
Scientific & Technical : 115
Total: 675

MANDATE

- To carry out basic and applied research in the fields of special glass, ceramics, refractories, ceramic coatings, composites and allied areas.
- To develop appropriate glass and ceramic materials and related technologies relevant to the country's economic, industrial and social needs including defence, space and atomic energy.
- To provide technical advisory and infrastructural services.

MAJOR R&D PROGRAMMES

- ★ Optical materials namely, optical glasses, laser glasses, speciality glasses, communication fibres
- ★ Oxide and non-oxide ceramics for engineering and high temperature applications
- ★ Electronic ceramics
- ★ Bioceramics
- ★ Ceramic coatings for protection of metal surfaces
- ★ Sol-gel derived glass and ceramic materials

- ★ Refractories for ferrous and non-ferrous industries
- ★ Low cost building materials
- ★ Composites
- ★ Energy conservation and pollution abatement in ceramic industries

SIGNIFICANT ACHIEVEMENTS

- ★ Twenty eight varieties of optical glasses, and radiation shielding window glasses; Nd-doped phosphate laser glass for use in range finders, silicate laser glass for use in plasma application and laser



Clear silica glass by sol-gel processing



Sol-gel derived alumina fibre mats



LPG sensor

glass discs and rods conforming to defence requirements; High density (5 cm/cc) radiation shielding window glass.

- ★ Graded multimode fibre as per CCITT specifications and optical fibre for use in radioactive environment
- ★ Antireflective and antiglare coatings on radiation shielding window glass, ophthalmic lens and sheet glass
- ★ High purity silica glass, alumina and yttria doped zirconia microspheres for plasma spray coatings and preparation of zirconia and alumina fibres by sol-gel route.

★ Synthetic high alumina aggregates (58-86% Al_2O_3), low moisture castables (45-90% Al_2O_3), high density dolomite sinters, high alumina bricks from sillimanite beach sand, insulating bricks from rice husk ash, rice husk ash nodules for use in steel plants, binders from waste red mud, sintered alumina products, high alumina cement (upto 75% Al_2O_3), cement free dense self-flowing castables, etc.

- ★ Low-cost building materials like hollow blocks, bricks, glazed tiles and bricks, roofing panels, glass reinforced gypsum composites - a substitute for flooring tiles from beach sand
- ★ Design and development of smokeless chulha with ceramic liner
- ★ Zinc oxide thin film based sensor for LPG leak alarm; Barium titanate based dielectric mix for multilayer capacitors; Ceramic membrane for bio-technological applications
- ★ Bone china technology for small scale industry; Improvement in quality and productivity of red clay pottery
- ★ Silver doped phosphate (radio-photoluminescent) glass for use as dosimeter, full scale crystal glass and ion selective glass electrodes for measurement of pH, pNa, pK and pCO_2 ; Phase pure fine powders of YBCO superconductors, fine powders of titanates of barium, strontium and lead; Synthetic quartz single crystals for oscillator and resonator; Conductive resistive thick film printing pastes for hybrid circuits
- ★ Reaction bonded Sic, Sic-mullite composite for thruster rocket nozzle, silicon nitride and other nitrogen ceramics involving boron, titanium and aluminium, high purity ultrafine active alumina powder, TTAC-TiC composites; Corrosion and abrasion resistant glass ceramic coatings on metals for aeronautical, chemical engineering and other applications
- ★ Ceramic heads for semi/total hip joint prosthesis
- ★ Energy efficient shuttle kiln (trolley type furnace) for high temperature application upto 1600°C and fuel efficient low thermal mass (LTM) kilns suitable for small scale pottery industry



Zero expansion glass



Fan body made of jute glass hybrid composite



Synthetic granite tiles from beach sand garnet

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Alumina ceramics for electrical and other engineering uses
- ★ Barium titanate based dielectric composition
- ★ Cordierite based saggers
- ★ Cordierite glass ceramic materials
- ★ Corrosion and abrasion resistant glass ceramic tiles from basalt
- ★ Coloured glass/ceramised glass coating on mild steel/cast iron for glass lined equipment

- ★ Glass electrodes for pH, pNa, pK measurements
- ★ Glass reinforced gypsum
- ★ Glazed wall tiles from common clay
- ★ Synthetic granite tiles and alumina aggregat
- ★ High alumina bricks from sillimanite beach sand
- ★ High alumina cement
- ★ High performance kiln car deck slab for pottery industry
- ★ High strength plaster of Paris

- ★ High temperature protective enamels for jet aeroengine components
- ★ Heat wheel
- ★ Insulating bricks from rice husk ash
- ★ Jewellery enamel
- ★ Lead free enamels for wire wound resistors
- ★ Lead free white and coloured enamels for aluminium
- ★ Low cost technology for production of fibre glass
- ★ Low moisture castables
- ★ Low thermal mass kiln
- ★ Matt glazed tiles for flooring and facing
- ★ Mica based textured coating
- ★ Moisture meter
- ★ Radiophotoluminescent glass
- ★ Sodium silicate from rice husk ash
- ★ Sol-gel application of antiglare coatings on ophthalmic lenses and other glasses
- ★ Staining composition of glass
- ★ Water filter candle

TECHNOLOGIES READY FOR TRANSFER

For the production of:

- ★ Barium titanate
- ★ Blood capillary pH electrodes and pCO₂ electrodes for anaesthesia monitoring equipment
- ★ Crystal glass
- ★ Crystallised coating for mild steel and stainless steel
- ★ Glass filters
- ★ High purity reactive alumina (99.5% Al₂O₃)
- ★ Jewellery glass
- ★ Nitride bonded silicon carbide refractories
- ★ Reaction bonded silicon nitride

- ★ Synthetic quartz single crystal
- ★ Thick film printing ink/paste for electronic industry
- ★ High performance glass electrodes
- ★ Hexagonal boron nitride
- ★ Vitreous enamel frit for coating
- ★ Bio-inert ceramic hip implants and ZnO based sensors for LPG leak alarm

FUTURE PROGRAMMES

Development and production of new types of optical glasses particularly lanthanum bearing glasses; Ceramic materials for bio-medical applications; Glass-ceramic coating materials for protection of power generation and other industrial equipment against corrosion, erosion and high temperature; Environment friendly improved ceramic kilns; Ceramic membranes for ultra and nano-filtration ranges; Antireflective coatings for large RSW blocks; Abrasion resistant coatings on plastics by sol-gel method; Solid oxide fuel cells as efficient energy conversion device
Lime refractories, Mag-Al Spinel, zirconia based refractories, Al_2O_3 -SiC-

Carbon and insulating pumpable refractories for use in iron & steel, cement and glass industry

Er-doped fibres for optical amplifier and phosphate laser glasses in rod and disc shapes; High density RSW glasses; High luminescent glass phosphor; Development of polarization preserving fibres for optical gyro applications; Products from agro industrial waste materials e.g. fly ash, red mud, rice husk, ash etc.; Development of ultra-low expansion coefficient glass-ceramics.

SPECIAL FACILITIES

A wide range of sophisticated instruments e.g. ESCA, SIMS, Surface Analyser, Q-switching for high power laser, non destructive testing, XRD, SEM with EDAX, DTA-TGA-DSC, PSA, Image analyser, High temperature creep bending tester

High temperature furnaces

ICP & AAS for chemical analysis

Vibrating sample magnetometer

SERVICES OFFERED

Testing and certification of glass and ceramic raw materials; Consultancy in ceramics, glass, refractories,

glass-ceramic coatings, vitreous enamels and composites and other related fields; Development and supply of small volume specialised materials and components.

TRAINING PROGRAMMES

Short term specialised practical training courses and entrepreneurship development training programme.

PUBLICATIONS

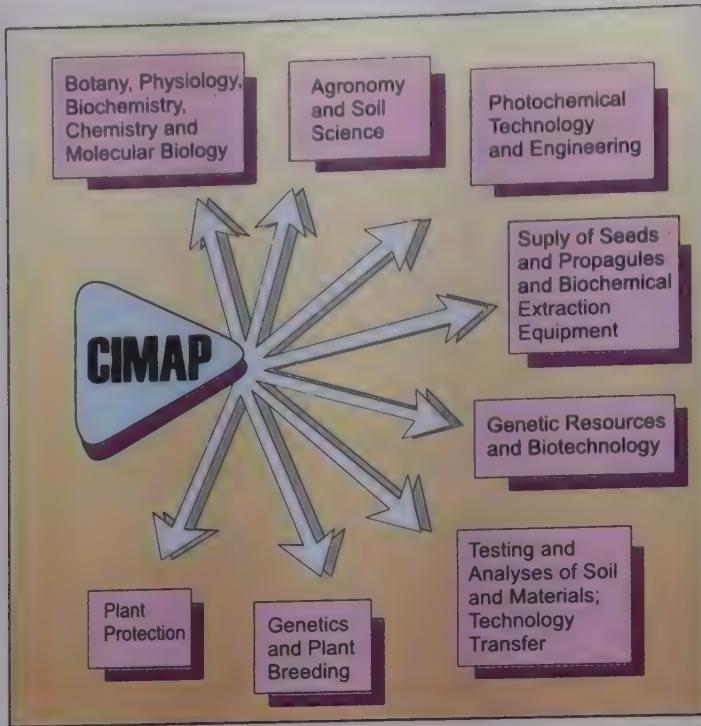
Annual Report, CGCRI Bulletin, Documentation list on Glass & Ceramics (monthly), GLANCE (inhouse news magazine; bi-monthly), Data Bank Bulletin (bi-monthly) and Glass & Ceramic Abstracts (bi-monthly).

CONTACT PERSON: Director

Extension Centres

CGCRI Naroda Centre
Naroda Industrial Estate
Ahmedabad-382330
Tel:079-2823345
Fax:079-2822052

CGCRI Khurja Centre
G.T. Road,
Khurja-203131
Tel:05738-42501
Fax:05738-42501



Central Institute of Medicinal and Aromatic Plants (CIMAP)

P.O. CIMAP, Lucknow 226 015

Telephone: 342676, 342677, 342680
 Telegram: MEDPLANTS, LUCKNOW
 Fax: 342666
 E.Mail: root@cimap.sirnetd.ernet.in
 STD Code: 0522
 Established: 1959

Director
 Dr Sushil Kumar
Grant
 1998-99
 Rs.1060 Lacs
Manpower
 Scientific & Technical: 110
 Total: 390

MANDATE

- To bring Genetic improvement, cultivation, production and chemical processing of medicinal and essential oil, dye and gum yielding plants
- To characterise and conservation of genetic resources of medicinal and aromatic plants (MAP)
- To define and modulation of yield determining steps of metabolic pathways concerned with chemicals of interest
- To detect and characterisation of new anti-microbial, anti-cancer and/or pesticidal chemicals of herbal origin
- To produce seeds and other propagating materials of MAP
- To formulate of the products of common use

MAJOR R&D PROGRAMMES

- ★ Developing of agrotechnologies and chemical and processing technologies for medicinal and aromatic plants. Basic research in the areas of genetic resources, biotechnology, cytogenetics, phytochemistry, plant physiology, biochemistry, plant protection, pharmacognosy and molecular biology.

SIGNIFICANT ACHIEVEMENTS

- ★ Development of improved cultivars and agronomic practices for higher yields per unit area of indigenous medicinal and aromatic plants, introduction of exotic medicinal and aromatic plants of commercial importance, development of process technologies and extension of know-how among the



Leaf pattern of newly developed var. KOSI of menthol mint (Top)
Unique RAPD profile (Primers MAP01-12) (Bottom)

farmers, entrepreneurs and industry.

★ The impact making technologies developed by CIMAP are high-yielding varieties of Japanese mint (MAS-1, Kalka, Himalaya and Kosi), Spearmint (MSS-1 and MSS-5), Scotch spearmint (MCAS-2), Bergamot mint (Kiran), Hill mint (Supriya), Palmarosa (PRC-1, Trishna and Tripta), *Citronella java* (Bio-13, Manjusha and Mandakini), Lemongrass

(Pragati, Praman, Cauvery and Krishna), Vetiver (KS-1, KS-2, Sugandha and Dharini), Lavender (Sher-E-Kashmir) and Rose (Noorjehan) and introduction of Bulgarian rose in Kashmir valley and geranium in the north Indian plains, development of know-how for menthol crystallization and fractionation of dementholized mint oil (DMO) for value-added products, development of modern distillation plant for rose oil and

improved field distillation unit for essential oil.

- ★ The institute has introduced a Chinese antimalarial drug plant *Artemisia annua* and developed the necessary agrotechnology for its cultivation and process technology for the isolation of artemisinin, the major constituent, and developed the drug arteether in collaboration with CDRI which has been commercialised as E-MAL.
- ★ Technologies for the anticancer drug taxol and production of rye-ergot has been developed and transferred to industry for commercial exploitation. Technology for the semi-synthetic taxol has been perfected
- ★ Pyrethrum, a source of a natural and safe insecticide, is being produced in the country based on the CIMAP technology. A superior strain (SPS-387), giving increased flower yield and resistant to frost and pests has also been developed. The crop is being tested under subtropical conditions.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Agrotechnologies of mints, aromatic grasses, lavender, geranium, pyrethrum, ergot, belladonna, davana, linaloe, coriander
- ★ Menthol crystallization and DMO processing
- ★ Pyrethrum oleoresin from pyrethrum flowers
- ★ Colchicine from *Gloriosa superba*
- ★ Ajmalicine from *Catharanthus* roots
- ★ Rose oil from rose flowers
- ★ Nagarmotha oil from *Cyperus scariosus*
- ★ Citronellol and hydroxycitronellal from citronella Java oil

Field view of *Artemisia annua* (the antimalarial drug plant)Field view of *Catharanthus roseus* (periwinkle)

Geranium plantation

- ❖ Citral ex lemongrass oil
- ❖ Distillation of essential oils

TECHNOLOGIES READY FOR TRANSFER

- ❖ Diosgenin from rhizomes of *Dioscorea deltoidea*
- ❖ Hyoscine and hyoscyamine from *Duboisia* and *Hyoscyamus* spp.

- ❖ Berberine hydrochloride from *berberis* spp.
- ❖ Total alkaloids from *Catharanthus* roots
- ❖ Geraniol and citronellol from Java citronella oil
- ❖ Geraniol from palmarosa oil
- ❖ Linalool and linalyl acetate from *Mentha citrata* oil

- ❖ Citral from lemongrass oil
- ❖ Cedarwood oil from *Cedrus deodara*
- ❖ Vetiver oil from vetiver roots
- ❖ Celery seed oil from celery seeds
- ❖ Plant design for rose oil
- ❖ Isolation of artemisinin from *Artemisia annua* and conversion of artemisinin into arteether
- ❖ Jasmine concrete and absolute from jasmine flowers
- ❖ Tuberose concrete and absolute from tuberose flowers
- ❖ Know how for formulation of mosquito repellent, food protectant and skin care products
- ❖ Tissue culture technique for the mass propagation of medicinal and aromatic plants

FUTURE PROGRAMMES

Development of improved varieties of related agrotechnologies for the medicinal and aromatic plants using high tech plant breeding and genetic engineering; Efficient utilization of cultivable land including waste, marginal-and dry-lands by developing suitable technologies; Development of genetically engineered edible vaccines plants and fourth generation antibiotic(s)

Plant molecular biology and biotechnology studies on secondary metabolites; Developing pest resistant medicinal and aromatic plants.

Germplasm collection of *Mentha* sp. (mints)

Bioprospection for phytochemicals active against human pathogenic viruses, bacteria, fungi and parasites and agricultural and stored food pests.

Data base on international R&D work on medicinal and aromatic plants

SPECIAL FACILITIES

Atomic absorption spectrophotometer, Infrared spectrophotometer, Ultraviolet spectrophotometer, HPLC, FT-NMR, gas liquid chromatograph, transmission electron microscope with scanning attachment, Vickers cytophotometer and GC-MASS spectrometer and a spectrum of instruments for molecular biology and biotechnology experimentation.

Research farms for large scale field trials under various agroclimatic conditions, Pilot Plants

SERVICES OFFERED

Consultancy/technical services; seeds material for cultivation and

processing/extraction of medicinal and aromatic plants and their material; testing and analyses of soils, biochemicals, crude drugs and essential oils; Assistance to growers in marketing products; preparation of feasibility reports, supply of planting materials, engineering designs and/or ready made pilot-plants, distillation, extraction and fractionation units.

TRAINING PROGRAMMES

Training programmes in the area of cultivation and processing of medicinal and aromatic plants are arranged at regular intervals.

PUBLICATIONS

Annual Report, A quarterly "Journal of Medicinal and Aromatic Plants Sciences (JMAPS)", and a Newsletter.

The Institute has brought out a number of farm bulletins and books. Books published by CIMAP are: Major essential Oil-Bearing Plants of India (1988), Major Medicinal Plants of India (1992), Dictionary of Indian Medicinal Plants (1992), The Opium Poppy (1983), Medicinal Plants in Skin Care (1994), Traditional Medicinal Plants in Skin Care (1994), Essential Oil Plants and Their Cultivation (1994), Medicinal Plants and Their Cultivation (1993), Proceedings of the International Symposium on Medicinal and Aromatic Plants (1983), Tissue Culture and Biotechnology of Medicinal and Aro-

matic Plants (1987); Marketing Directory (1997) and Indian Medicinal and Aromatic Plants Facing Genetic Erosion (1997)

CONTACT PERSON: Director Field Stations

CIMAP Field Station,
P.O. Dairy Farm, Nagla-263143
Dist. Nainital (U.P.)
Telephone:05944-34445

CIMAP Sub Field Station
Vill-Purara, Near Garud-Baijnath
Dist. Bageshwar (U.P.)
Telephone:05944-34445

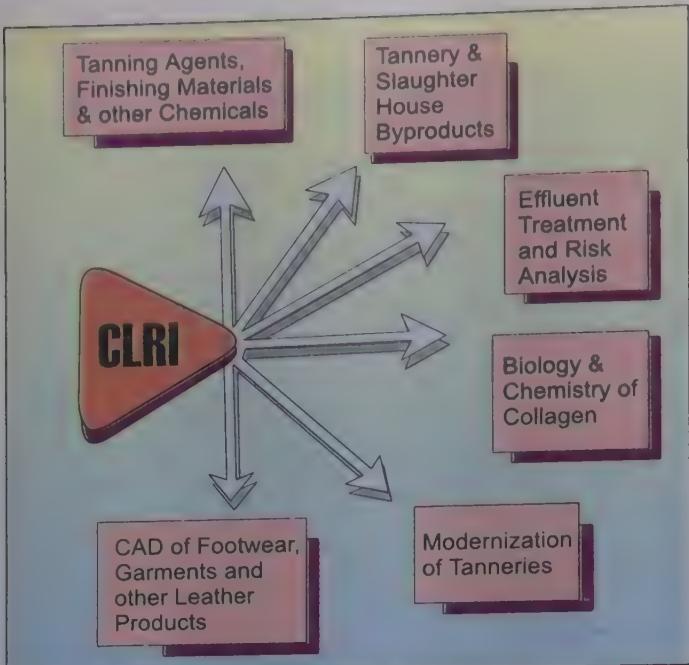
CIMAP Field Station,
Allalsandra near Yelahanka
GK VK P.O.
Bangalore-560065 (Karnataka)
Telephone:080-8460997,8460563

CIMAP Field Station,
Boduppal, Uppal Road,
Hyderabad-500039 (A.P.)

CIMAP Field Station,
Attvampatti, P.B.No.22,
Kodaikanal-624101 (T.N.)

CIMAP Field Station,
Coorg,
Mysore(Karnataka)

CIMAP Field Station,
Bonera,
Distt. Pulwama-192301,
Kashmir(J&K)
Telephone:01933-41293



Central Leather Research Institute (CLRI)

Adyar, Chennai 600 020

Telephone: 4910846, 4910897

Telegram: LESERCH, Madras

Fax: 4911589, 4912150

E.Mail: clrimd@md2.vsnl.net.in

STD Code: 044

Established: 1948

MANDATE

- To seek excellence in research in biological, chemical and engineering sciences
- To serve as the national apex body in the areas of leather and related products
- To provide education and training in leather and allied sciences at national and international levels
- To render technical assistance to leather industry

MAJOR R&D PROGRAMMES

★ Technologies for cleaner processing of leather, solid waste minimisation, cost control and quality addition (Enzyme assisted processes, chrome recovery and reuse, optimum utilisation of water, and high exhaust chrome tanning.)

★ Modernisation of tanneries

★ Relocation of tanneries in well designed complexes

★ Computer aided designs for footwear and garments

★ Finishing of split leathers and quality upgradation of lower ends

★ Molecular biology of collagen and metal collagen interactions

★ Waste water management

★ Tannery and slaughterhouse byproducts including fallen carcass utilisation

★ Industrial safety and risk & hazard analysis studies

SIGNIFICANT ACHIEVEMENTS

★ Basic Research contributions relate to combination tanning

Director
Dr T.Ramasami
Grant
1998-99
Rs. 1580 Lacs
Manpower
Scientific & Technical : 125
Total : 600



Demonstration of improved vegetable tanning process at Athani (Karnataka), a traditional rural training centre

mechanisms, mechanism of shrinkage phenomena, aluminium and zirconium tanning materials, structural aspects of collagen, nutritional disorders and collagen, structural stability of chrome-collagen compounds, domestic vegetable tannin resources, novel NMR techniques and chemistry of chromium and its complexes.

④ Applied Research relating to new and innovative techniques for leather processing, cleaner and environment friendly leather processing technologies to reduce effluent load, upgradation of low grade raw materials to produce high value added finished leathers, production of variety of finished leathers such as softy

leathers, nubuck, etc. from buff hides, programmes for relocation of tanneries in exclusive complexes, nation-wide survey on leather product units, establishment of chrome recovery plants and successful implementation of Leather Technology Mission programme. Sponsored by All India Skin and Hide Tanners and Merchants Association (AISHTMA), the institute has successfully demonstrated the cleaner leather processing technologies in 553 tanneries located in different parts of Tamil Nadu.

LEATHER TECHNOLOGY MISSION(LTM)

CLRI has been implementing a technology driven development programme - A mission with a human face - for the Indian Leather sector through LTM. The mission is supported by Government of India. Under this programme, a total of 167 projects, spread over 16 States in India have been undertaken. Demonstration of improved technologies, upgradation of human skills, improved engineering inputs for modernisation of leather sector, effluent treatment, quality improvement of raw materials through better animal care and fuller utilisation of fallen carcasses are some successful technology elements under LTM.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ④ High-performance tanning compounds Alutan & Alcrotan; Comprehensive microprocessor based technology package for modernisation of tannery operations.
- ④ Technologies for synthetic fatliquors.
- ④ Process know-how package for phosphorylated fatliquors.
- ④ Technology on microprocessor-controlled blended-vegetable tanning extracts.



High class finished leathers from low grade raw materials



State-of the art shoe testing laboratory

- ★ Chrome recovery and reuse, 100 plants are working in Vaniyambadi, Ambur, Kanpur and Jalandhar
- ★ Know-how package on trimethoxybenzoic acid
- ★ Know-how package on Thiram & Ziram
- ★ Upflow Anaerobic Sludge Blanket (UASB) reactor for tannery effluent treatment
- ★ Technology on keratin hydrolysate retanning and filling agent
- ★ Risk assessment studies
- ★ A modern nonchlorophenol biocide
- ★ Cleartan CR
- ★ Process for polyurethane based finishes which include (i) medium soft binder and (ii) medium hard binder
- ★ Development of polyurethane adhesive for footwear application
- ★ Claron binder
- ★ Collagen sheet
- ★ Animal meal from tannery fleshings

- ★ Caspro-T, a textile additive
- ★ Cenlecol F—beer clarifying agent
- ★ Maxibloc-Bone Implant

TECHNOLOGIES READY FOR TRANSFER

- ★ New techniques for processing and finishing of buffalo splits and lower ends into utility/speciality leathers
- ★ Gait analysis and Computer Aided Design (CAD) based footwear designs
- ★ Washable suede leathers
- ★ Waste water treatment (Chemo Autotropic Activated Carbon Oxidation - CAACO)
- ★ Split finishing by transfer coating technology
- ★ Buff softie upholstery leathers
- ★ Process know-how for acrylic syntan
- ★ Process know-how for removal of colour and amino acid smell from salt
- ★ Biocides for curing raw hides and skins
- ★ Seal sink finish

- ★ Tanning salts — Clarichrome, Cleartan AL

★ Clarizyme

- ★ Preparation of stropping disc leather from cow hide

- ★ Dog chews

FUTURE PROGRAMMES

Delivering cleaner leather process technologies to tanners located in Calcutta, Kanpur, Jalandhar, etc.; Continuation of Leather Technology Mission programme (Phase II); Quality improvement of raw hides and skins; Objective assessment of leathers; modernisation programmes; Zero or low waste technologies; Design and fabrication of shoes and other leather products; Leather complexes and common effluent treatment plants; Industrial safety and risk hazard analysis.

SPECIAL FACILITIES

Pilot tannery; Footwear pilot plant; Chemical pilot plant; Byproducts pilot plant; Polymer: Testing & Synthesis; Design engineering cell; CAD/CAM; Fashion studios; National Information Centre on Leather and Allied Industries (NICLAI); Testing Labora-

tories for footwear, leather and chemicals.

SERVICES OFFERED

Comprehensive services for setting up leather processing units; Development of technology package for establishing tanneries, leather chemical units, effluent treatment plants and leather products manufacturing units; Safety and risk analysis studies for various industries.

TRAINING PROGRAMME

CLRI offers B.Tech.& M.Tech. (Leather) and M.Tech. (Footwear Science and Engineering) and Ph.D. in leather technology and in basic sciences affiliated to Anna University, Chennai.

CLRI has been serving as an international training centre for leather and leather products sectors for candi-

dates sponsored by FAO, UNIDO, UNDP, CSC, ITC, etc. CLRI offers several specialised training programmes on regular basis (Diploma and Certificate Courses) in Leather processing, Footwear, Leather goods, Leather garments manufacturing and Byproducts Utilisation.

PUBLICATIONS

Annual Report; LESA (Leather Sciences Abstracts) (monthly); books and biennial reports.

CONTACT PERSON: Director

Regional Centres For Extension & Development (RCED)

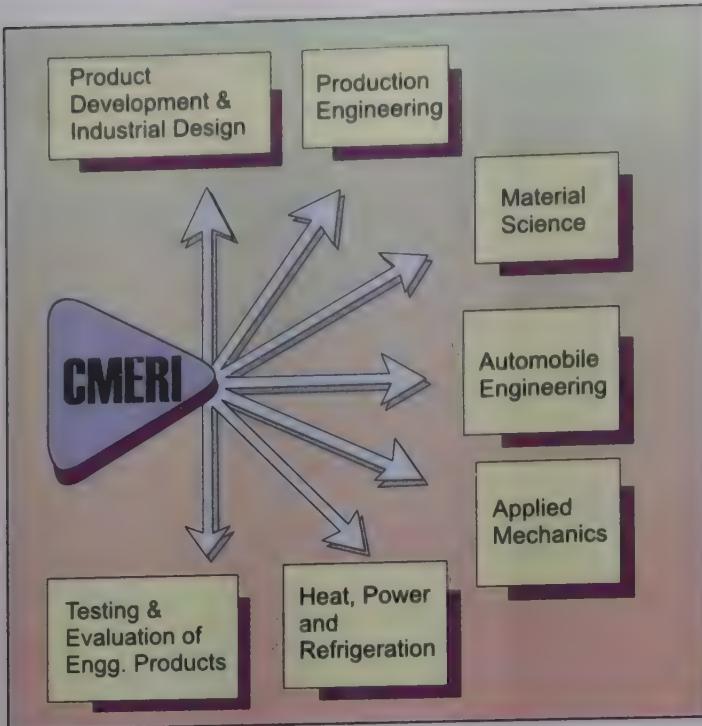
Regional Centre for Extension & Development (CLRI)
Polytechnic Campus
Kherwadi, Bandra(E)
Mumbai-400 051
Phone: (091)22-6457088

Regional Centre for Extension & Development(CLRI)
3/1C Matheswartola Road
Calcutta 700 046
Phone: (091)33-3292381

Regional Centre for Extension & Development(CLRI)
407/377A, Jajmau,
Kanpur 208 010, UP
Phone: (091)512-450449

Regional Centre for Extension & Development(CLRI)
Nakodar Road, Jalandhar 144 003
Phone: (091)181-272815

Regional Centre for Extension & Development(CLRI)
GIDC 4th Phase, Vatva,
Ahmedabad 382 445
Phone: (091)79-5830352



Central Mechanical Engineering Research Institute (CMERI)

Durgapur 713 209

Telephone: 546818, 546826, 546749
 Telegram: MECHSEARCH, DURGAPUR
 Fax: 546745, 546505
 E.Mail: root@cscmeri.ren.nic.in
 Internet: <http://www.cmeri.com>
 STD Code: 0343
 Established: 1958

Director

Shri Hardyal Singh
Grant

1998-99

Rs. 2040 Lacs

Manpower

Scientific & Technical: 115
 Total: 755

MANDATE

- To be a agile and innovative R&D organisation providing engineering solutions especially for high speed mechanism, industrial drives, post harvest machinery and in emerging manufacturing technologies.

MAJOR R&D PROGRAMMES

RESEARCH

- ★ Time compression technologies for rapid development of components of metals, plastics and ceramics using layered manufacturing methods
- ★ Applications of rapid prototyping and tooling in the engineering and medical field, and
- ★ Casting methods for improved component integrity

PRODUCT DEVELOPMENT

- ★ Post harvest machinery & equipment; Consumer durables; Industrial automation equipment; Special-purpose machines; Components & Machine accessories

for automobile and engineering industries.

SIGNIFICANT ACHIEVEMENTS

- ★ Sugarane harvester with applications in crop cutting, detopping and partial detrashing, stacking etc. The machine can also be used as a prime-mover for other mechanized farm appliances and for some tractor operations such as fertilizer spreading, mechanical cane planting, fork lifting of pallets of fertilizer, cane plants, trash etc.
- ★ Fluidised Bed Dryer for oilseeds and also for other cash crops; An efficient single roll decorticator for groundnut seeds.



Investment casting facilities



ITPD oil expeller



Computerised methoding in progress



Epoxy concrete bed for grinding machines



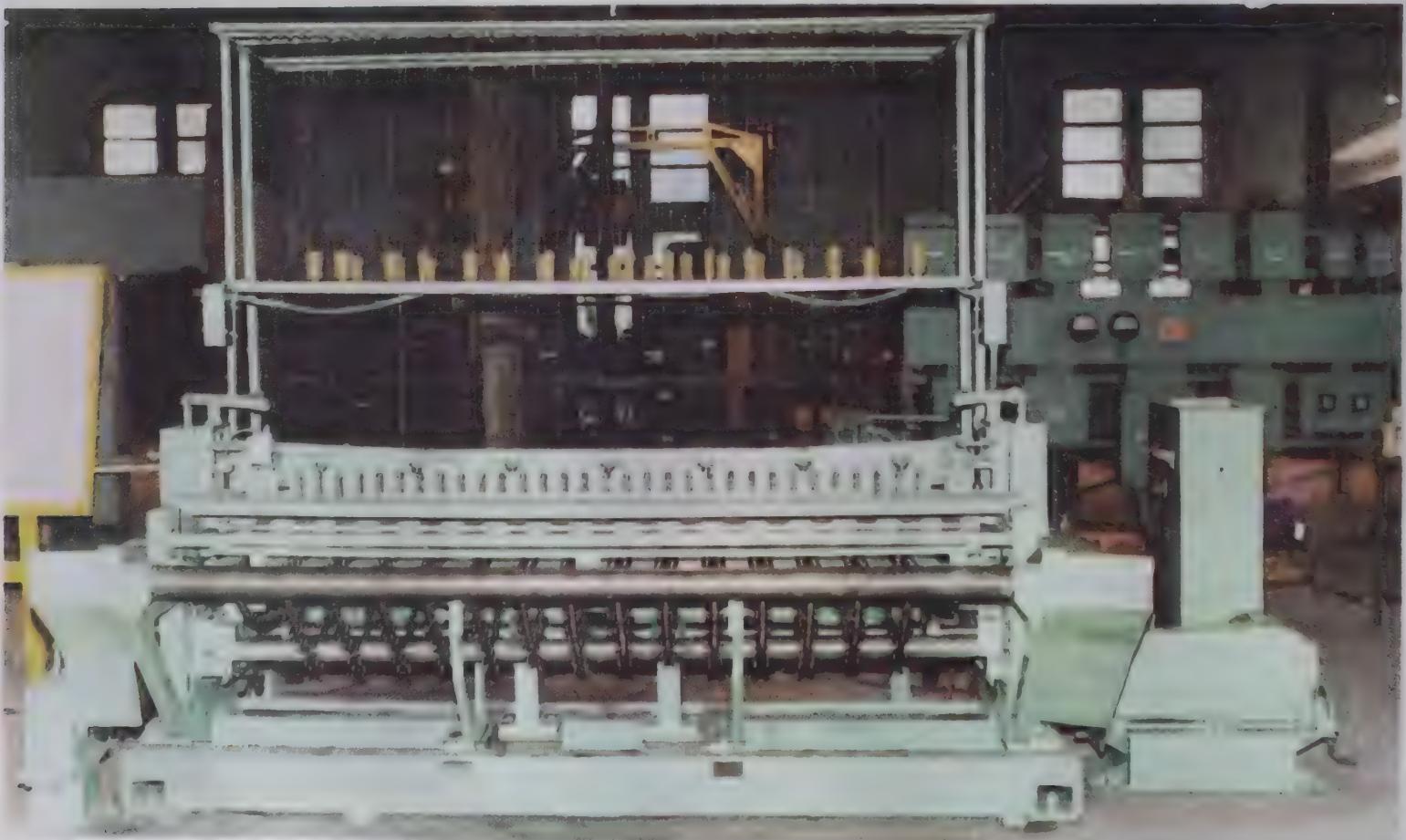
Typical precision components made through the spin casting route

- A special stitch bonding machine to manufacture geotextiles. Straw mattresses using agro-waste.
- A SCARA Manipulator for utilization in the forging industry.

- Development of a Sea-bed Mining System.
- The Institute is certified as an ISO 9001 organisation with the recognition extending over:



Fluidised bed dryer for agrocrops



Stitch bonding machine



Typical LOM prototypes



Sugarcane harvester

- ★ Design, Development & Manufacture of; Industrial Machines and Automation Products, Farm Machinery & Post Harvest Technology, Process Plant & Equipment; Manufacturing Technology; Rapid Prototyping & Tooling, Precision Casting & Foundry; Testing, Evaluation & Calibration; Engi-

neering Materials; Engineering Components & Products; Instrument & Gauges.

TECHNOLOGIES READY FOR TRANSFER

- ★ SCARA Robot
- ★ Epoxy Concrete bed for machine Tools

- ★ Aluminium alloy bicycle Hub
- ★ Iron removal plants
- ★ 1 TPD oil expeller
- ★ Fluidised Bed Dryer for oilseeds.

SPECIAL FACILITIES

Design Engineering; Computer-aided design; Solid modeling; Design analysis

Rapid Prototyping & Manufacturing:

- Layered object manufacturing - LOM (HeliSys) and stereolithography (3D System)
- Development of physical model of prototypes for automobile components, medical implants, consumer durables, etc.
- Development of rapid tooling, using rapid prototyping, vacuum casting and TAFA process

Manufacturing Technology; CNC machine tools environment; Cam manufacturing; Customized heat treatment; Rapid measurement and certification; Fluidised bed heat treatment system

Foundry & Precision Casting:

- Computerized design of gating and risering system, and defect analysis; Sand molding facilities; Shell molding facilities; Investment casting facilities; Spin casting facilities; Induction furnace 200Kg/50Kg; Rotary furnace for non-ferrous

SERVICES OFFERED

Residual Life Assessment services in the following areas:

- Power plant equipment; Chemical process plant structures and foundations; Industrial machines

Testing, and calibration facilities in the following areas:

- Metrology; Mechanical testing; Non-destructive testing; Vibration and noise analysis; Metallurgical, chemical and mechanical analysis of engineering materials and components; Thermal evaluation;

CMERI

- Analysis of lubricants Pressure testing.
- Value-added bureau services in product development through reduction in the product development cycle time and production costs, improvement of product designs, product customization and enhancement of product quality.

TRAINING PROGRAMMES

Advanced training in CAD tools, RP&M system, Modern Casting methods, etc.

Specialized training in Design Analysis, Finite Element Modelling (FEM), Geometric Dimensioning and Tolerancing (GD&T) and tolerance stack analysis.

PUBLICATIONS

Annual Report, Mechanical Engineering Bulletin (quarterly) and "Technology Tidings" quarterly house bulletin.

CONTACT PERSON: Director

Extension Centres

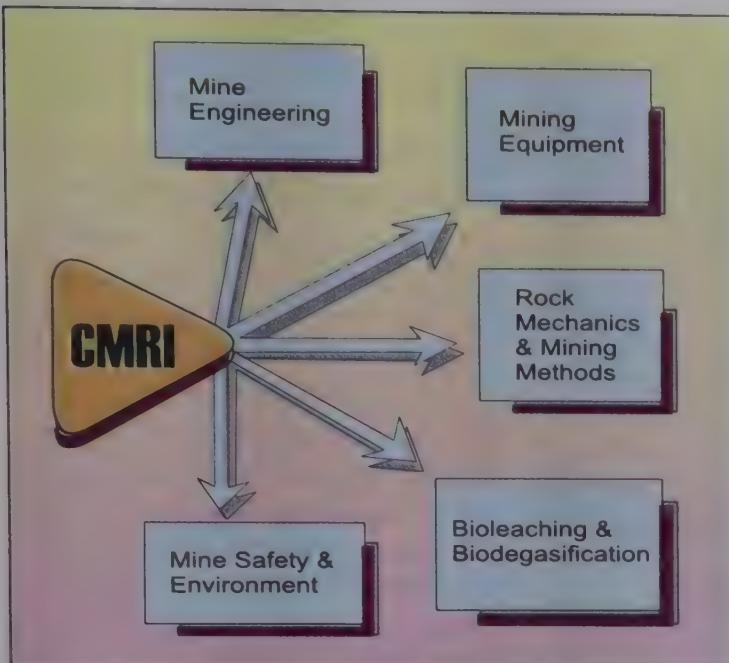
Mechanical Engineering Research & Development Organisation (MERADO),
Gill Road, Ludhiana 141006
Tel: (0161)494413, 490716, 490328
Fax: (0161)491572

Mechanical Engineering Research & Development Organisation (MERADO),
CSIR Complex, P.O. TTTI Taramani,
Chennai 660113
Tel: (044)2350709, 2300298
Fax: (044)2352179

Mechanical Engineering Research & Development Organisation (MERADO),
NCL Campus, Pune 411008
Tel: (0212)228224, 335285
Fax: (0212)330743

Mechanical Engineering Research & Development Organisation (MERADO),
CSIR Cochin Complex,
Kalamassery 683109
Tel: (0484)540861
Fax: (0484) 542513

Calcutta Liaison Office
Fifth Floor, BNCCI Building
23 RN Mukherjee Road
Calcutta 700001
Tel: (033)2485176
Fax: (033)2480748



Central Mining Research Institute (CMRI)

Barwa Road, Dhanbad 826 001

Telephone: 202326, 203043,
203070, 203090

Telegram: MINSEARCH, DHAN-BAD

Fax: 202429, 205028

E.Mail: director@cscmri.res.nic.in

STD Code: 0326

Established: 1956

Director (Acting)

Dr A.K. Dubey

Grant

1998-99

Rs. 1180 Lacs

Manpower

Scientific & Technical: 130

Total: 440

MANDATE

- To provide scientific and technological inputs to mineral industries with a view to optimise mining technologies for better safety, economy, conservation and environmental management especially through R&D on rock mechanics, mining methods, machinery, equipment and instruments.

MAJOR R&D PROGRAMMES

- ★ New mining technologies for methods of working, roof support, stability of workings, stowing and backfilling, bioleaching, blasting and fragmentation, explosives, subsidence and ground movement, environment management and ecology, ventilation, fire, gas emission and degasification.
- ★ Design and development of coal mining and allied industrial equipment, machinery and instruments.
- ★ Development of underground space technology as well as technology for the construction of Hydel Projects and Tunnels.

SIGNIFICANT ACHIEVEMENTS

- ★ Design, development and introduction of cable bolting using old haulage ropes for the extraction of difficult thick coal seams underground.
- ★ Wide stall method of mining to maximise recovery of coal from thick seams developed on pillars without disturbing the surface features, environment and ecology.
- ★ Method to maximise recovery of coal underneath fragile ecology without packing of the voids.
- ★ Method based on underpinning of lower seam section to any height for extraction of thick sections of



Testing of footwears for miners



High set remote prop developed at CMRI

contiguous seams in the presence of weak unstable formations.

- ❖ Numerical modelling approach for development of old and new underground panels under difficult mining conditions.
- ❖ Processes for the prediction of techniques of coal recovery through the design of underground pillars and classification of rock mass.
- ❖ Adoption of longwall mining successfully through assessment of cavability and support capacity.
- ❖ Assessment for safe and efficient use of longwall system for mining at shallow depths with high thickness of alluvium in sub-surface strata.
- ❖ Techniques for analysis of stability of slopes and safe slope design in open pit, waste dump and rock slopes.
- ❖ Pressure balancing technique and high expansion foam for the control of underground fire.
- ❖ Fire protective coating for prevention of spontaneous heating of

coal mines to control coal mine fire.

- ❖ Technique for the assessment of the status of fire in coal mines.
- ❖ Multizonal ventilation system for underground coal mines to improve working environment and safety particularly in old extensive mine workings.
- ❖ Methods based on numerical modelling and field observations for prediction and control of subsidence in mines for the safety of surface features and structures above single and multi-seam workings.
- ❖ Land reclamation technology for overburden coal waste dumps.
- ❖ System for efficient backfilling of mines with flyash and mill tailings as substitute of river sand.
- ❖ Explosives for safe blasting of hot holes in fire-affected coal mines.
- ❖ New blasting techniques to improve fragmentation and reduce fly rock formation in coal mines.
- ❖ A software to assess precisely the fragments of varying sizes and measure as well as compare their parameters like width, length, area, perimeter, shape and spherocity graphically as well as statistically.
- ❖ Remote control release device with steel rigid prop for roof support.
- ❖ A high set remote prop for freshly exposed mine roof supports.
- ❖ Device for setting up steel arches in coal mines with ease safety and efficiency.
- ❖ A low power and portable data logger system for monitoring of environmental conditions underground.
- ❖ Study of the carrying capacity of Damodar river basin for the recommendation of alternative development scenario to reduce

environment degradation of the mineral rich area.

★ Developed various feasible hard rock mining methods for non-coal mines.

★ Introduced technology at pyrites and phosphates and iron-ore mines for the management of over-burden dumps to stabilise dump slope, check infiltration of surface water, increase fertility of soil, control wind and water pollution, produce forage and browse for animals, preserve bio-diversity and promote post mine land use.

★ Recommended methods for planning and design of effective, economical and eco-friendly operations of small scale mines.

★ Studied environmental impact of mining of limestone in ecologically fragile area to suggest mitigative measures and delineate areas for mining with minimum damage.

★ Studied feasibility for storage facilities of various products in underground rock structures and abandoned mines.

★ Design of underground hydel projects, power houses and tunnels.

★ Design of blasting patterns and environmental management for effective ventilation in tunnels.

★ Some useful designs and developments; digital temperature indicator; data acquisition and mine management system; surface air lock; coal getting machine; dust collectors; portable methanometers and detector tubes for toxic gases.

★ Roof support items e.g. hydraulic prop, screw prop, triangular chock, steel chock, recoverable roof bolts, roof bolt setter and roof bolting and rope stitching systems.

★ Effective contributions made in the areas of monitoring and control of blasting in coal mines, bio-de-gasification and bio-leaching of

coal, fire hazards and its control in coal mines, utilization of coal bed methane, prediction of methane emission during coal mining, air and water pollution assessment and control in mining areas, communication and data monitoring systems as well as design of coal mining equipment and instruments, condition monitoring for maximum utilisation of power supports, development and application of cryogenic technology for control of coal mine fire and quick reopening of mines, design and modification of hydraulic stowing plants, evaluation of post detonation toxic fumes of explosives and incendivity of detonators in coal dust atmosphere.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

★ Fire protective coatings/Sealant

FUTURE PROGRAMMES

Eco-friendly Methods for Extraction of Complex Mineral Deposits; Model Gallery to understand the mechanism of fire spreading in coal mines; Softwares for effective ventilation in mines; Numerical models for stability and design of mines, caverns, dams, tunnels etc.; Packages for determination of optimum parameters for effective blasting in mines, tunnels and dams; Systems for blind backfilling to stabilise abandoned mining areas and control of old mine fire; Explosives and detonators for use in adverse and critical mining conditions; Systems for monitoring and control of environmental pollution; Facilities for modernisation of testing, analysis and calibration of mining and allied industrial machinery, equipment, instruments and components.

SPECIAL FACILITIES

Testing for mechanical properties of coal and rock samples; Compositional analysis of coal and other minerals, mine, air, other gases and

water samples; Testing and certification of PVC conveyor belts and cement capsules for anchorage strength; Testing of miner's safety equipment like methanometers, industrial safety helmets, caplamps assemblies, batteries, flame safety lamps, etc.; Testing of explosives and accessories; Calibration of anemometers, velometers, manometers and investigation and testing of brattice cloth and PVC ventilation ducting; Testing for performance behaviour of pit props, steel cogs, hydraulic jacks, friction and hydraulic props, chocks, suspension beams, link bars, etc.; Material testing of wire ropes, cage suspension and haulage gear components like safety hooks, cage shackles, chains, suspension gears etc.

Calibration of 500 tonnes prestretching bed to assess its reliability with extenso-dynamometer; Chemical, metallurgical and microstructural analysis of mining and allied industrial equipment and cage suspension gear components.

SERVICES OFFERED

Contract research, consultancy and technical services in the areas of stability analysis and design of coal and metal mines; Design and development of mine support systems; Mine subsidence prediction; Control and analysis; Numerical modelling and computer programming; Physical modelling for safe exploitation of deposits; Assessment of capability and estimation of support capacity for longwall faces; Slope stability analysis and design for coal; Rocks and waste spoils; Mine fill practices for stabilization and optimum exploitation; Stabilization and rehabilitation of old mine workings; Design, development and monitoring of blasting operations and vibration monitoring and control; Bio-degasification and bio-leaching; Stability analysis, design and development of tunnels, dams and underground caverns.

Fire hazard evaluation and control; Assessment, design and development of pollution control measures in mines and mining areas; Environmental management of mining operations; Reclamation and management of mine waste dumps; Sustainable development of fragile mining areas; and ventilation network planning and design as well as design and development of mine safety equipment, machinery and instrument .

TRAINING PROGRAMMES

The Institute conducts training courses in its areas of specialization for user agencies.

PUBLICATIONS

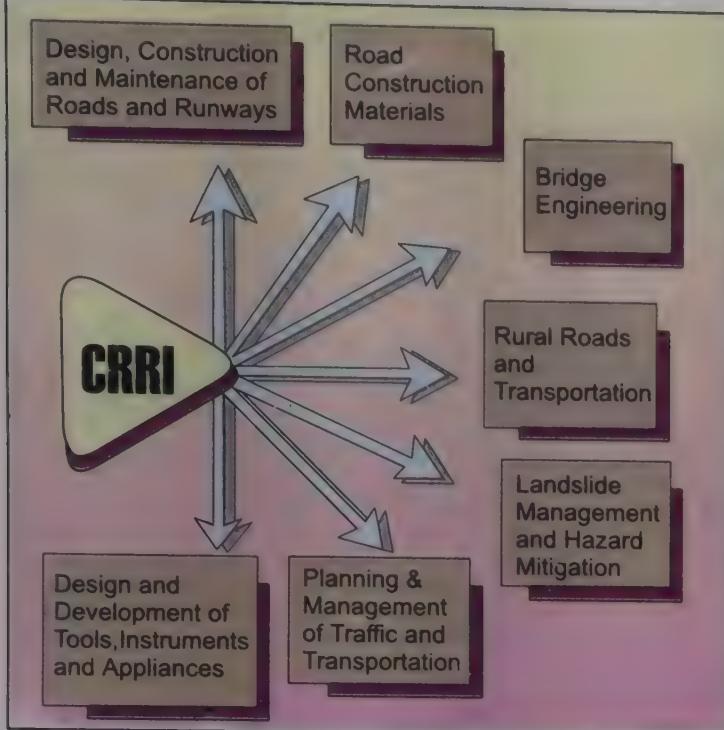
Annual Report, Journal of Mining Research (Quarterly), CMRI Newsletter (once in four months), Technical reports and Hindi Newsletter entitled "KHANAN MANJUSHA".

CONTACT PERSON: Director

Field Stations

CMRI Unit,
54, Shankar Nagar,
Nagpur 440010
Telephone: 0712-527628
Telegram: MINSEARCH, NAGPUR

CMRI Unit,
Central Building Research Institute,
Roorkee 247667
Telephone: 01332-72196



Central Road Research Institute (CRRI)

**Delhi-Mathura Road, P.O. CRRI,
New Delhi 110 020**

Telephone: 6848917
Telegram: ROADSEARCH,
NEW DELHI
Fax: 6845943
E-Mail: director@cscrri.ren.nic.in
STD Code: 011
Established: 1948

Director
Dr P.K. Sikdar
Grant
1998-99
Rs. 1100 Lacs
Manpower
Scientific & Technical: 130
Total: 520

MANDATE

- To conduct basic and applied research in important areas of highway engineering and allied aspects
- To provide knowhow for the construction of Cost-effective, Durable and Safer Roads
- To evolve improved, rational and economical methods of design, construction and maintenance of roads, embankments, runways and bridges
- To develop new Tools, instruments and appliances relevant to indigenous/international highway practices
- To plan transport network of different city sizes in India
- To analyse Road traffic accidents and to study and quantify the impact of road traffic on environment
- Characterisation and testing of natural & marginal waste materials for use in low-volume roads
- Design and quality control management of road works

MAJOR R&D PROGRAMMES

- ★ Pavement design and performance, road condition monitoring, pavement management system, highway planning and design, pavement deterioration modelling,

landslide management, hazard mitigation, and improved transportation including planning for emerging urban needs.

- ★ Rural roads, Material characterization, Highway instrumenta-



Road constructed by using industrial waste

tion, deterioration and rehabilitation of bridges, Traffic engineering, Road safety and environmental problems.

SIGNIFICANT ACHIEVEMENTS

PLANNING AND MODELLING

- ★ Policies for Road Planning and Investment; Road user cost study to develop models for different road user cost components; Traffic simulation modelling study; Development of Transport Sub-models and density models for work trip ends for different city sizes in India.
- ★ Riding quality models for trunk routes in the country
- ★ Pavement deterioration models for Indian conditions
- ★ Axle load studies for pavement management
- ★ Inventorisation of national highways
- ★ Development of appropriate technologies for use of marginal/waste material and design of rural/low volume roads
- ★ Mass rapid transport system of different city sizes in India
- ★ Planning of transportation systems including high/medium capacity



Road under construction using steel slags

ROADS IN URBAN & METRO CITIES

- ★ Planning road system for Bombay Metropolitan Region for the year 2001, establishing data base for traffic and transport flows for different cities in India, evaluation of mobility levels and transport problems of some selected cities. Comprehensive studies have also been undertaken on Mass Rapid Transport System(MRTS) for Delhi and Light Rail Transit(LRT) system for Jaipur.
- ★ Non-destructive testing of bridges; computer programme for inventory rating of slab bridges, T-beam slab bridges and Warrens truss bridges and corrosion inhibition in concrete bridges and surface coating of rebars.
- ★ Contributed in evolving better designs and formulation of codes of practices for expansion joints, wearing courses and bearings for the bridge decks. Developed a technique for measuring deformation during the load test of bridges.
- ★ Investigations to quantify the air pollution levels due to road traffic and hazards and cost-effective remedial measures. Indigenous driver evaluation system devel-
- oped to improve safety on roads. Investigation of road traffic accidents.

RURAL ROADS AND SOIL STABILISATION

- ★ New technologies for design, construction and maintenance of rural/low volume roads using locally available materials, domestic and industrial wastes. The institute has brought out a comprehensive document on development of rural roads in India and also a working manual for field engineers on construction and maintenance of low volume roads.
- ★ Control techniques and preventive measures to avert landslides; horizontal drains; coir netting to promote vegetation on the hill slopes; geogrids to control rock falls; geotextiles to stabilize subgrade. Techniques have been developed to improve the strength and load bearing capacity of weak strata in many situations.
- ★ Low temperature tar as road binder; improved bituminous materials and mixes with polymer additives, fibre reinforcement, anti-oxidant and rejuvenating agents and durable bitumastic



Tractor bound technology for rural roads

compounds for the paving of roads and bridge decks.

- ★ Use of burnt clay pozzolana and lime pozzolana mixes for partial replacement of lime along with various useful techniques for cement concrete road construction, i.e. lean cement concrete, lime flyash concrete, brick sandwiched concrete pavements, composite rigid pavement and roller compacted concrete pavement. Rapid repair materials such as epoxy resins and magnesium phosphate cement for quick repair of distressed cement concrete pavements.
- ★ A new paving system comprising hollow precast concrete blocks with interconnecting dowels developed for desert areas of Rajasthan. High-strength, interlocking concrete block pavement (ICBP) for special purpose paving in rural and urban areas.
- ★ Developed and patented a range of road roughness measuring devices, viz. profilograph, unevenness indicator, automatic road unevenness recorder and micro-

processor based axle mounted roughness measuring system. The riding quality of trunk routes has been characterized and pavement deterioration models, spectrum of axle load on national highways, quality control methodology and pavement management system have been developed.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Automatic road unevenness recorder; Investigation & design of pavements for special conditions & their strengthening.
- ★ Specifications for elastomeric bearings for bridges.
- ★ Polymer modified binders for construction of roads and airfields.
- ★ Landslide correction and hazard mitigation measures.
- ★ Safety measures for accident prone highway stretches.
- ★ Axle mounted system for measuring road roughness.
- ★ Computer software.
- ★ Impact tester for measuring in-situ CBR.
- ★ A new pavement system for desert areas.
- ★ A process for the production of magnesium phosphates cement for emergency repair.
- ★ Vertical profile meter.
- ★ Electronic probe.

SPECIAL FACILITIES

Heavy test bed with a 60 ton load frame for evaluating experimental road sections under static and repetitive loading; Mu-meter, Portable skid tester for measurement of skid resistance
Testing under simulated field condition using 40t semi-mobile loading frame

Calibration of automatic road unevenness recorder units

Falling Weight deflectometer for non-destructive pavement evaluation

Abay beam for calibration of response type equipment

Dynamic non-destructive testing of pavements for their structural properties

Benkelman beam fitted with LVDT amplifier recorder used for load deflection measurement

'Dipstick' auto-read profiler to measure roughness

Weigh-in-motion system to measure vehicle load and speed

Computer aided triaxial testing facility for soils and other granular materials

Concrete block making Machine for production of high-strength, interlocking concrete blocks

SERVICES OFFERED

Recommended practices and guidelines

Testing and calibration

CONSULTANCY SERVICES

Traffic engineering design of roads; Geometric design of road intersections/interchanges; Techno-economic analysis of road projects; Transport system planning and analysis; subsoil exploration; Ground improvement problems; Geosynthetics; Land slide mitigation; Zonation of hazardous regions; Construction of road on softer soils; Stabilisation of expansive soils; Rural road design and construction; Strengthening and improvement of failed pavements; Alternate/modified binders; Design and construction of interlocking concrete block pavement; Rating of existing bridges; Design of composite overlays; Axle load studies for pavement management; Strengthening of concrete roads; Design of concrete and bituminous mixes; Evaluation of rigid and flexible pavements; Mastic asphalt construction; Corrosion problems; Airfield pavements;

Maintenance/management aspects; Development of software.

TRAINING PROGRAMMES

Refresher Course in highway engineering, traffic and transportation engineering for senior highway engineers

Training Course on Use & Maintenance of Automatic Road Unevenness; Recorder/profilograph/bump integrator and Introduction to other related Devices

Training programme on rural road technology & soil Stabilisation; Elas-

tomeric bearings for bridge design engineers; material testing & quality control techniques of highway construction; Design, construction, quality control & maintenance of cement concrete roads; Pavement maintenance, management system; Design, construction, quality control and maintenance of bituminous surfacing of roads and runways; Road and embankment of soft grounds; Bridge engineering.

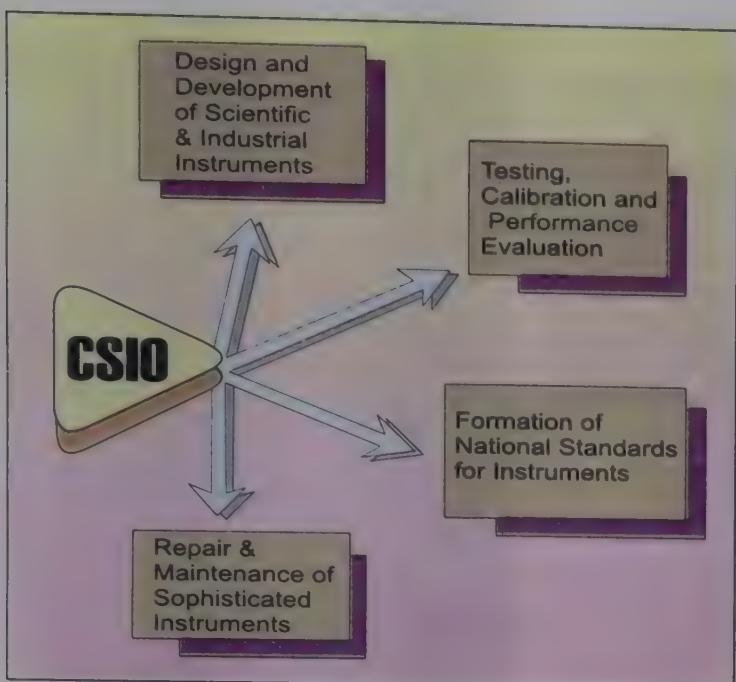
CRRI has also provided training to the road engineers from countries, like China, Nepal, Srilanka, Bhutan

and Bangladesh. International courses on rural road planning, design, construction and maintenance have also been organised in the Institute.

PUBLICATIONS

Annual Report, CRRI Newsletter, CRRI Technical Report, Research Papers. The Institute has also brought out a valuable reference volume on 'Index to CRRI publications' along with abstracts (1952 - 1995).

CONTACT PERSON: Director



Central Scientific Instruments Organisation (CSIO)

Sector 30, Chandigarh 160 020

Telephone: 657190
 Telegram: CENINSTS,
 CHANDIGARH
 Fax: 657267, 657082
 E-Mail: root@cscsio.ren.nic.in
 STD Code: 0172
 Established: 1959

Director (Acting)

Dr R.P. Bajpai

Grant
 1998-99
 Rs. 1400 Lacs

Manpower

Scientific & Technical: 120
 Total: 700

MANDATE

- To undertake research, design and development of scientific and industrial instruments; components and instrument systems
- To undertake repair and maintenance of sophisticated instruments through a network of Service & Maintenance Centres, located in various parts of India
- To offer technical assistance to industries and various other users of instruments by way of fabrication, testing, calibration, analysis and performance evaluation, etc.
- To provide advanced training in instrument technology aimed at human resource development for the benefit of precision instrument industry and R&D institutions
- To survey and assess the present and future needs of various types of scientific and industrial instruments in the country and to collate, coordinate and disseminate information on the subject

MAJOR R&D PROGRAMMES

- ★ Development of instrumentation for microelectronics.
- ★ Opto-electronic and opto-mechanical systems for defence applications.
- ★ Coherent and integrated optics.
- ★ Geo-scientific instruments, Medical electronic instrumentation for health care.
- ★ Instrumentation for condition monitoring.
- ★ Instruments for environmental monitoring.



Pulse oximeter



Signal generation unit for PC based driver evaluation system

- ★ Energy management instrumentation and analytical instruments for use in agriculture, Agri-electronic instruments.
- ★ Food processing and explosives detection.

SIGNIFICANT ACHIEVEMENTS

Instrumentation for Microelectronics

- ★ Development of molecular beam epitaxy (MBE) system, stepper optical lithography (SOL) system, reactive ion beam etching (RIBE) system, reactive ion etching (RIE) system, RF/DC sputtering system, electron beam controlled evaporation (EBCE) system, LSI/VLSI testing system, and automatic wafer rinser/dryer.

Geo-scientific Instrumentation

- ★ Development of seismological instruments viz solid state memory based seismic data recorder & analyser for field applications, inclinometer/tiltmeter sensors alongwith geologger, land based seismic data telemetry system, and analog & digital seismographs.

Medical Instrumentation

- ★ Development of 4 MeV medical linear accelerator for radiation therapy, patient support system (patient couch), ophthalmoscope/otoscope diagnostic set, pulse oximeter, low cost portable ultrasound scanner, RF hyper-

thermia delivery system for localised cancers, infusion pump & controller, servo controlled baby care incubator, endoscopes, and signal generation unit for PC based driver evaluation system.

Optical & Opto-Electronic Instrumentation

- ★ Development of fiber optic holography, coherent optical techniques & modules, optical integrated circuit (OIC) devices, 75 mm refracting telescopes, and projection units of plotting tables for KAMORTA class ships.

Agri-Electronic Instrumentation

- ★ Development of inductive electromagnetic soil salinity tester with electrode system, integrated system alongwith specific reagents for the direct measurement of Nitrite-N, Nitrate-N, Ammonia-N & Inorganic Phosphate-P, and iodine value meter for edible oils.

Analytical Instrumentation

- ★ Development of scanning tunnelling microscope (capable of operation in air & ultra high vacuum), scanning electron microscope, UV-Vis spectrophotometer, microprocessor based atomic absorption spectrophotometer, industrial gas analyser, atomic force microscope, and disinfection unit for treated sewage using UV radiations.

Environmental Monitoring Instrumentation

- ★ Development of recording stack opacity monitor, digital turbidity meter, opto-electronic smoke density monitor for automobiles, low voltage room electrostatic precipitator.

Process Instrumentation

- ★ Development of sensors for robotics, flexible manufacturing systems (FMS) and process control.

Energy Management Instrumentation

- ★ Development of on-line energy analyser for energy monitoring & conservation, and computer-aided energy monitoring & targeting system for process industry.

Condition Monitoring Instrumentation

- ★ Development of instrument systems & related technology for condition monitoring of critical rotating machine for generation of electric power.

Transportation Instrumentation

- ★ Development of transducers for road survey system.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Digital indicator for inclinometer/tiltmeter.
- ★ Patient support system (patient couch).
- ★ Ophthalmoscope & otoscope diagnostic set.
- ★ Drug infusion pump & controller.
- ★ Pulse oximeter.
- ★ Resuscitation bag (Ambu bag) for neonates.
- ★ Servo controlled baby care incubator.
- ★ Neonatal oxygen monitor.



Reactive ion beam etching (RIBE) system

- ★ Profile projector objectives (10X, 20X, 25X, 50X, 100X).
- ★ Doorscope.
- ★ Economic field usable pH meter.
- ★ Low voltage room electrostatic precipitator.
- ★ Electro-spot testing kit for ferrous and non-ferrous alloys.
- ★ Single puncture laparoscope.

TECHNOLOGIES READY FOR TRANSFER

- ★ Molecular beam epitaxy (MBE) system.
- ★ Reactive ion beam etching (RIBE).
- ★ RIE system.
- ★ RF/DC sputtering system.
- ★ Electron beam controlled evaporation (EBCE) system.
- ★ LSI/VLSI testing system.
- ★ Wafer rinser/dryer.
- ★ Automatic wafer prober.
- ★ Solid state memory based seismic data recorder & analyser.
- ★ Land based seismic data telemetry system.

- ★ Portable ultrasound scanner.
- ★ RF hyperthermia delivery system for localised cancers and study of thermal patterns for clinical hyperthermia.
- ★ Signal generation unit for PC based driver evaluation system.
- ★ Driver reflexes testing system.
- ★ Endoscopes (Laparoscope, Borescope and Gastroscope).
- ★ Iodine value meter for edible oils.
- ★ Integrated system alongwith specific reagents for the direct measurements of Nitrite-N, Nitrate-N, Ammonia-N and Inorganic Phosphate-P.
- ★ Atomic force microscope.
- ★ Scanning tunneling microscope (Air and ultra high vacuum versions).
- ★ Industrial gas analyser.
- ★ Sensors for robotics, FMS and process control.
- ★ On-line energy analyser for energy monitoring and conservation.
- ★ Computer aided energy monitoring and targeting system for process industry.
- ★ Transducers for road survey system.

FUTURE PROGRAMMES

The development of multi-purpose molecular beam epitaxy system, micromachining devices, portable metal oxide human breath sensors for detection of offensive odour & alcohol, instruments for measuring snow/glaciers parameters for assessing & forecasting snow bound run-off water, seismological studies at Chandigarh and around, snow sensors alongwith compatible field data logger, higher energy (15 MeV) medical linac, head-up display system for aircraft, helmet mounted display system, semiautomatic pick & place machine for fine pitch and standard SMDs, 3-D holographic

non-destructive testing techniques for defect diagnosis of precious art objects/paintings/sculptures, 35 mm mini-pan camera for mini RPV Falcon, fiber optics & holographic kits, imager spectrograph, portable kits & instruments to test the quality of oil and detection of pollutants, portable system for measurement of Aflatoxin in oilseeds & cakes, glow discharge lamp atomic emission spectrometer, concealed explosive detectors, off flavour detection system for edible oils, instrumentation and related system for condition monitoring of critical rotating machines in thermal power plants etc.

SPECIAL FACILITIES

Precision optical processing facility
Modulation transfer function (MTF) test bench
CNC wire cut electric discharge machine (EDM)
Liquid nitrogen plant

SERVICES OFFERED

Testing & Calibration

Analytical testing, metallography, heat treatment and calibration. Services are also offered to tackle various specific technical problems of the industry from time to time.

Repair & Maintenance Service of Instruments

Repair & maintenance of a variety of instruments by Service & Maintenance Centres at Chandigarh, Delhi, Jaipur and Chennai.

TRAINING COURSES

Indo-Swiss Training Centre

Imparts high-grade technician-level training in precision instrument technology: three-year diploma course in instrument technology; four-year advanced diploma course in die & mould making; mechatronics and industrial automation.

*M.Tech. Course in
Instrumentation*

M.Tech. Course in Instrumentation conducted in collaboration with Panjab University, Chandigarh.

Other Training Programmes

Management development programmes on operation, maintenance & repair of biomedical equipment for Third World Countries; Winter School on STM for Imaging Macro-molecules, Training Programme on Repair & Maintenance of Scientific Instruments for SAARC Countries; BITS practice school training programme, etc.

PUBLICATIONS

Annual Report, Communications in Instrumentation (Quarterly), Directory of Scientific Instruments & Components Manufactured in India

CONTACT PERSON: Director

Service & Maintenance Centres

Service & Maintenance Centre (CSIO)

CSIR Complex, 2nd Floor, NPL Campus, Dr. KS Krishnan Marg, New Delhi-110012
Telephone: (091)011-5736290, 5786794
Telegram: CENINSTS, NEW DELHI

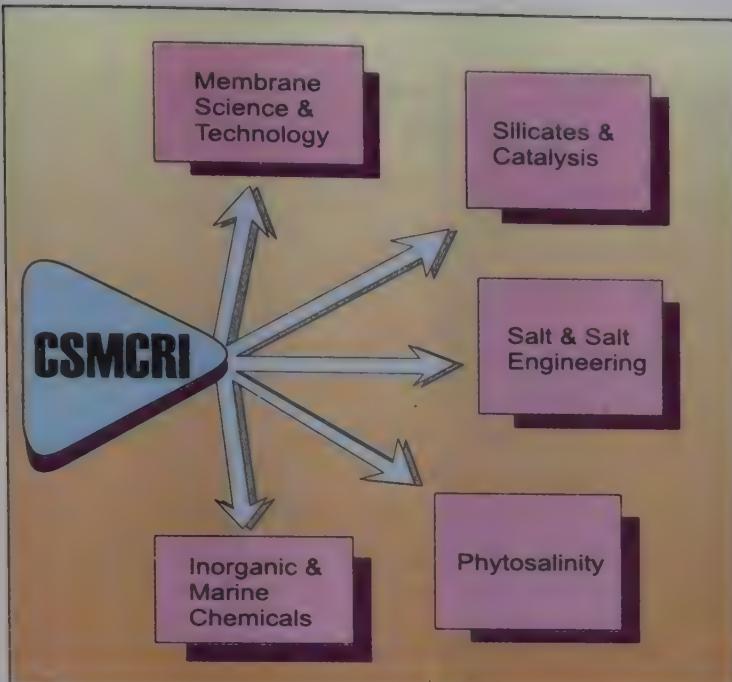
Service & Maintenance Centre (CSIO)

Plot No.CFC-1,
Malviya Industrial Area,
Jaipur-302017

Telephone: 520992
Telegram: CENINSTS, JAIPUR

Service & Maintenance Centre (CSIO)

CSIR Complex,
Taramani,
Chennai-600113
Telephone: 2352061
Telex: 041-6876 CSIR IN
Telegram: CONSEARCH, CHENNAI



Central Salt & Marine Chemicals Research Institute (CSMCRI)

Gijubhai Badheka Marg,
Bhavnagar 364 002

Telephone: 567760
Telegram: NAMAK, BHAVNAGAR
Fax: 566970
E.Mail: general@cscsmri.ren.nic.in
STD Code: 0278
Established: 1954

Acting Director

Dr Pushpito K Ghosh

Grant

1998-99

Rs. 870 Lacs

Manpower

Scientific & Technical: 100

Total: 365

MANDATE

- To carry out research & development in the fields of salt, marine and other inorganic chemicals.
- To develop membrane technologies for desalination of brackish and seawater, separation/concentration of industrial fluids and effluent treatments.
- To promote cultivation and utilisation of marine algae for extraction of algal chemicals and drugs.
- To promote exploitation of coastal dune sand and saline soils through introduction and cultivation of indigeneous and exotic halophytic plants of economic importance.

MAJOR R&D PROGRAMMES

- Salt & Marine Chemicals; Silicates & Catalysis; Reactive Polymers; Reverse Osmosis; Phytosalinity; Marine Algae.

SIGNIFICANT ACHIEVEMENTS

- Designed and developed a salt washery for washing of salt to remove calcium, magnesium and sulphate.

• Developed a process for producing refractory grade magnesia with 97.5% MgO;

• A process for manufacturing detergent grade Zeolite A Powder from sodium aluminate liquor;

• A process for the preparation of colloidal silica;

• Developed organo clay suitable for high temperature grease formulation on Lab. scale;



Thin film composite (TFC) membrane based R.O. pilot plant

- ★ Developed know-how for an integrated system to produce high purity brine for membrane cell technology; A technique for in-situ reduction of calcium impurity from salt during production using polyelectrolyte.
- ★ Developed a homogeneous catalyst which can be used at ambient temperature with air as oxidizing agent to oxidize bromide to bromine present in sea water, bittern and solution containing bromide.
- ★ Developed Electrodialysis technology for desalination of brackish water/sea water for supply of drinking water, deashing of sugar cane juice, effluent treatment of zinc smelter and rayon mills, spent liquor and chrome liquor effluent from leather industry.
- ★ Developed on bench scale acrylic type amino methyl phosphonic type resin for brine purification and revealed that the resin is at least 1.5 times better than the internationally available resins. The resin will now be synthesised for pilot plant studies.
- ★ Developed Thin Film Composite(TFC) membrane based Reverse Osmosis system suitable for desalination of saline water. De-

veloped proto-type Thin Film Composite(TFC) membrane fabrication machine to prepare 1 m. wide membrane of any length. Also developed 100 mm. dia x 1 m. long membrane modules which are under test at Madras Refineries Ltd., Chennai to treat sewage water.

- ★ Acclimatization of an exotic seaweed, *Kapphycus*, the best source of carrageenan has been done in Indian marine water on experimental basis. Carrageenan content of the cultivated plants were found to be comparable to that of the plants grown on commercial scale in Philippines.
- ★ Developed know-how for cultivation of *Gracilaria*, *gelidiella* and *Ulva fasciata*;
- ★ Agro-technology for cultivation of desert economic plant Jojoba and halophytic plants *Salvadora persica* and *Salicornia brachiata*; an UNDP assignment on propagation of Jojoba and *Jatropha* has been undertaken.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Plants based on reverse osmosis technology have been installed in

different parts of the country and abroad;

- ★ Technologies for free flowing table salt, dairy salt for butter and cheese, high purity AR grade sodium chloride and iodized salt;
- ★ Bromine; Agar-agar; Low density precipitated silica;
- ★ Technology for demineralization of sugarcane juice;
- ★ Zeolite-A(Detergent Grade); to 223 licences have benefited through technology transfer.

TECHNOLOGIES READY FOR TRANSFER

- ★ Jojoba body cream;
- ★ Jojoba skin lotion;
- ★ Deashing of sugarcane juice;
- ★ Free flow iodized salt;
- ★ Bacterial grade agar-agar from seaweeds.

FUTURE PROGRAMMES

Inorganic Chemicals:

Improving quality of salt from sub-soil brine and upgradation and mechanization of solar salt industry; Process for the production of inorganic chemicals and recovery of value added chemicals (mostly inorganic) from downstreams of inorganic chemical industries; Preparation of thermally stable (more than 600°C) pillared clay using mixed metal oxide; Preparation of organoclay for specific uses such as in grease, paints and as adsorbents; Preparation of inorgano-organo clays as specific adsorbents where inorganic component imparts thermal stability and the organic moiety the hydrophilicity; Heterogenisation of homogenous catalyst. Encapsulation of metal complex in zeolite cavity, in-situ synthesis of zeolite and sol gel method to achieve greater selectivity for a complex reaction; Hydroformylation of long chain olefin to alcohol/alde-



a



b



Stages in micropropagation of *Suaeda nudiflora* from nodal explants:

- Shoot proliferation from axillary buds after 6 weeks of culture on MS media + BAP and KN
- Elongation of microshoots in sub-culture medium
- Rooting in charcoal as well as charcoal free medium (MS 1/2 strength)
- Six weeks after transplantation to potting mixture

hyde; Composite nanomaterial for specific catalytic reactions like selective hydrogenation of unsaturated oils and functionalization of benzene, etc.; Reduction of carbon dioxide to

value added products using different metal complexes as catalyst; Synthesis of new photoactive binuclear complexes from new assymmetric ligands; Synthesis of new redox active

mono-nuclear complexes from new N-donor highly unsaturated hydrocarbon ligands; Photochemical and photocatalytic transformation on select organic compounds using light as energy input.

Membrane Science & Technology:

Ionic membranes & polymeric adsorbents; Modifying existing techniques for ion-selective membranes preparation to achieve enhanced mechanical strength. Improvement of ED stack to international standard; Solid polymer electrolyte cells for organic synthesis; Studies of water dissociation process using bipolar membranes to treat effluent streams and also chemical conversion from salt to acids and alkalies; Development of resin based catalysts for conversion of organic compounds to value added products; Development of reactive polymers for recovering trace gallium from aluminium ore processing streams and decontamination of arsenic from water.

Optimizing parameters for large scale production of polyamide Thin Film Composite(TFC) Membranes. Scaling up and quality control in TFC based Reverse Osmosis(RO) membrane preparation. Preparation of 1 m. wide, 100mm and 200 mm diameter spiral module for RO applications for desalination and waste water treatment.

Application of TFC membrane for industrial separation processes like concentration of milk and enzymes, production of ultrapure water, etc.

Development of microfiltration and nanofiltration membranes for industrial separation processes.

Biosalinity:

Development of elite strains of marine algae for producing high quality polysaccharides e.g. agar and carrageenans; Culture and cultivation of marine algae and introduction of exotic seaweeds in Indian coast; Devel-

opment of soma clonal variants and selection of high yielding and productive strains of commercially important seaweeds; Evaluation of biological activity of various natural products and study marine microbial bioactive compounds; Biotoxins from marine algae and bacteria

Survey, assessment and in-situ and ex-situ maintenance of germplasm of coastal halophytes and other plant species; Assessment in the field trials and biochemical/genetical studies on mechanism of salt tolerance at cellular level; Sex determination in dioecious economic plants; Genetic variability and genetic improvement

in halophytes for seed oils and proteins; Enzymatic/chemical conversion of seed oil/protein of economic plants into useful industrial compounds; Protocol for ex-situ preservation of halophytes and somaclones through callus culture; Screening of halophytes and other plant species for

isolation and characterization of bioactive compounds

SPECIAL FACILITIES

A wide range of modern instruments for characterization and structure determination of chemicals, e.g. equipments for x-ray diffraction (both single crystal and powder), gas chromatographic analysis, atomic absorption spectrometer, Fourier transform IR spectrometer, FT-NMR Spectrometer, etc.

Instrumental facilities for surface area measurements, determination and distribution of particle size.

SERVICES OFFERED

Testing and analytical services on salt, brine, water and soil samples; potassic fertilizers, soda ash, minerals like limestone, magnesite, dolomite, magnesia gypsum, ion-exchange resins, China clay sieve analysis, particle size determination and determination of traces of

heavy metals in salt samples. The Institute takes up consultancy work on problems related to areas of its specialization.

TRAINING PROGRAMME

Need based short-term training courses.

PUBLICATIONS

Annual Report

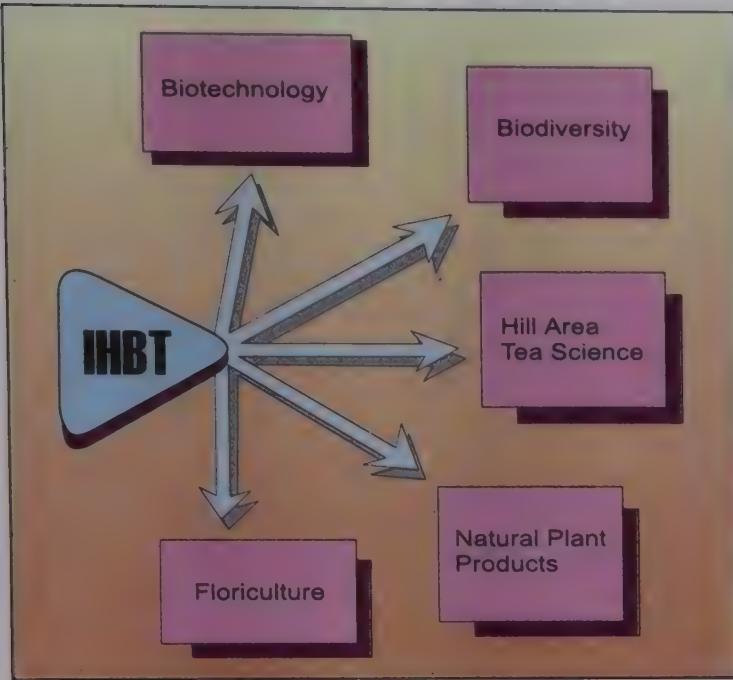
CSMCRI Newsletter

CONTACT PERSON: Director

Field Stations

CSMCRI, Marine Algae Research Station,
Mandapam Camp, Ramnad Dist.,
Tamil Nadu 623519
Telephone:04573-41422

CSMCRI(SWI) Field Station,
100/16 1st Lane, Gandhinagar,
Berhampur, Ganjam Dist.,
Orissa 760001
Telephone:0680-202743



Institute of Himalayan Bioresource Technology (IHBT)

Palampur, H.P. 176 061

Telephone: 30411
 Telegram: CONSEARCH
 Fax: 30433
 E.Mail: director@csihbt.ren.nic.in
 STD Code: 01894
 Established: 1983

Director
 Dr P.S. Ahuia
Grant
 1998-99
 Rs. 500 Lacs
Manpower
 Scientific & Technical: 25
 Total: 75

MANDATE

- To provide an Industrial R&D base for establishment upgradation and sustainable management of bioresources in the Himalayan region through agrotechnology, processing technology and biotechnology.

MAJOR R&D PROGRAMMES

- ★ Relate to floriculture, tea science, biotechnology, natural plant products and biodiversity.

SIGNIFICANT ACHIEVEMENTS

- ★ Development of Agrotechnologies for the cultivation of tea, essential oil bearing plants (Tagetes Damask rose) gladiolus, chrysanthemum, rose, carnation, lilliums, tulip, bird of paradise and bamboo.
- ★ Released two improved varieties of Damask rose namely 'Jwala' (for low hills and plains) and 'Him-roz' (for mid hills and colder regions);

- ★ Standardisation of techniques for tea processing and essential oil distillation;
- ★ Raising of export quality gladiolus hybrids through conventional breeding programme;
- ★ Increase in the shelf-life of kinnow and litchi fruits;
- ★ Development of low-cost greenhouses; Virus indexing in selected commercially important flowering plants.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Agrotechnology for rejuvenation of dilapidated china hybrid tea;



Mechanical tea harvesting



Asiatic hybrid lily



Somatic embryogenesis in tea

- ★ Agrotechnology for transplanting of young tea for replanting in traditional areas and extension planting in non-traditional areas;
- ★ Advanced agrotechnologies for commercial cultivation of gladiolus, carnation, chrysanthemum, rose etc. through training to entrepreneurs;
- ★ Technologies for cultivation and processing of Damask rose (*Rosa damascena*) and wild marigold (*Tagetes minuta*);
- ★ Design of distillation units for essential oil extraction;
- ★ Micropropagation of tea and bamboos.

TECHNOLOGIES READY FOR TRANSFER

- ★ Technology packages are available on tea processing;
- ★ Tea-based soft drink concentrates;
- ★ Technology for developing transgenic of tea;
- ★ Rose oil and *Tagetes* oil distillation;
- ★ Constituent oriented production technology of *Tagetes minuta* oil;
- ★ Agrotechnologies for growing of Lilliums and Tulips and *Valeriana wallichii* commercially;

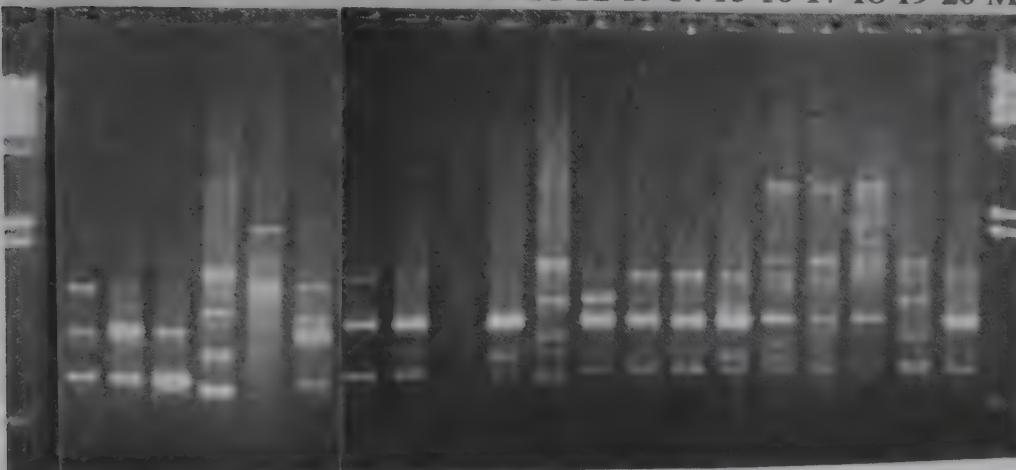
FUTURE PROGRAMMES

Mechanization in tea plantations and introducing practices of organic farming; Improving the processing and development of value added tea products; Introduction of tea in non-traditional areas; Improving the production and quality of aromatic crops like lavender geraniums and tuberose; Extraction of floral absolutes from Damask rose and Jasmine; Standardisation of post harvest technologies for some high value cut flowers; Providing superior disease-free plant stocks; Prolonging the vase life of lily carnation gladiolus and tulip; Genetic characterisation (DNA fingerprinting); domestication (seed biology and nurseries) and cultivation



Improved rose-oil distillation unit with inbuilt cohobation column

M 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 M

DNA fingerprinting of *Artemisia* spp.

of important economic flora of western Himalayas; Bioprospection of biomolecules for the development of drugs/pesticides etc.; Bioprospection of genes for wider adaptation of plants.

SPECIAL FACILITIES

Tea gardens, Rose plantations, Bamboo plantations, Short duration high density energy tree plantations, Herbal gardens and Herbarium; Pilot

plant facilities for extraction of essential oils and for tea manufacture and quality monitoring

Radio isotope facilities; Well-equipped tissue culture and molecular biology labs; Distillation facilities for high-value aromatic plant products at pilot plant scale; Pesticide residue testing laboratory for tea; Manufacture and quality monitoring of tea (green and black); Greenhouse growing of flowers; Cold Room for forcing treatment of bulbs; Plant Virological studies; Mobile Lab for bio-prospection studies.

SERVICES OFFERED

Consultancy services are offered to researchers, industry, and growers on development of economic plants project formulation and evaluation; collaborative research; turnkey ventures and database search and bibliography services, in the area of tea, medicinal and aromatic plants, ornamental plants, biodiversity and tissue culture and other biotechnological techniques for propagation of these plants, plant virus testing, chemical analysis, training.

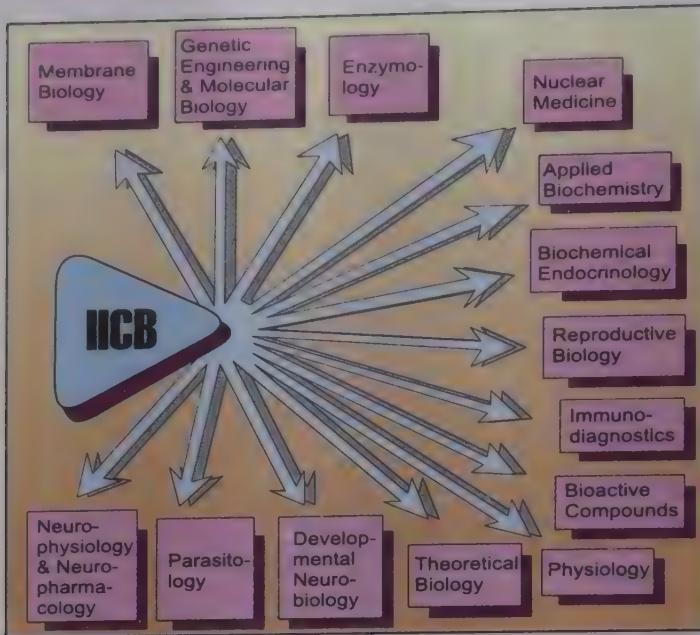
TRAINING PROGRAMMES

On agrotechnologies and processing technologies for tea, essential oil-bearing plants, cultivation of flowers for commercial purposes, efficient management/regeneration of rare plants and tissue culture methodologies.

PUBLICATIONS

Annual Report and a biannual newsletter. Technology bulletins and brochures are issued periodically.

CONTACT PERSON: Director



Indian Institute of Chemical Biology (IICB)

4, Raja S.C. Mullick Road,
Calcutta 700 032

Telephone: 4733491/0492
4733493/6793

Telegram: LIVINGCELL
Fax: 4730284, 4735197
E.Mail: iicb@sirnetc@sirnetd.
ernet.in

STD Code: 033

Established: 1935 (Taken over by
CSIR: 1956)

Director

Dr Samir Bhattacharya

Grant

1998-99

Rs. 1100 Lacs

Manpower

Scientific & Technical : 125

Total: 365

MANDATE

- To conduct Research in biological sciences for seeking solution to medical and biological problems in national and global context

MAJOR R&D PROGRAMMES

- ★ Research on natural products of medicinal, biological and industrial value and synthesis of products of value
- ★ Development of innovative immunoassay techniques and tissue-targeted drug delivery system
- ★ Understanding the basis of bacterial and parasitic infections and development of biotechnologies applicable to the diagnosis and chemotherapy of diseases
- ★ Delineation of the cellular and molecular basis of brain development and genesis and prevention of movement disorders
- ★ Investigation of the cellular basis of gastric hyperacidity and gastric ulceration and development of a Neem-based process for efficient treatment
- ★ Development of radiopharmaceuticals for myocardial imaging and renal and hepatobiliary studies

SIGNIFICANT ACHIEVEMENTS

- ★ Developed a bacteriophage typing technique for identifying cholera infection.
- ★ Construction of a complete physical and genetic map of *V.cholerae* 569B.
- ★ Developed a potential live oral cholera vaccine strain, is ready to undergo human trial
- ★ Developed 99mTc cysteine as a renal as well as myocardial infarct agent.



ELISA kits for estimation of thyroid hormones

- ★ An extract of Neem (*Azadirachta indica*) bark or its active principle has been found to control gastric hyperacidity and ulceration
- ★ A process for the preparation of an extract from human placenta containing glycosphingolipids and endothelin-like constituents peptides useful for the treatment of vitiligo has been developed and patented in various countries including US and Japan.
- ★ A process for the preparation of new potent non-toxic lipopolysaccharide (LPS) useful for preventing endotoxemia or sepsis has been developed.
- ★ Developed an improved process for the isolation of bioactive saponins from natural sources, viz. the seeds of *Mimusops elengi*.
- ★ Mechanism of tRNA import in leishmania mitochondria has been established
- ★ A leishmania parasite bank has been established.
- ★ Significant role of IL-8 and its receptors in inflammation and NK

cells in countering leishmaniasis has been established

- ★ Role of thyroid hormone in brain development has been evaluated
- ★ Techniques for detection and quantitation of human movement disorders have been developed

TECHNOLOGIES READY FOR TRANSFER

- ★ An ELISA, a technology for the measurement of alphafetoprotein (AFP) by polyclonal/monoclonal antibodies.
- ★ A cell surface marker developed for identification and quantification of the marker on leukemic blast cells for the detection of minimal residual disease (MRD) in acute lymphoblastic leukemia (ALL) which is more pronounced in children.
- ★ A novel probe for detection of endotoxin from snail *Achatina fulica* proved to be very useful in food industry, clinics and also in blood banks.
- ★ A hemagglutination assay for diagnosis and follow-up of visceral leishmaniasis patients using 9-O-acetylated sialic acid binding lectin developed. The technique is suitable for field trial as it needs finger prick blood and time needed is just half an hour.
- ★ Enzyme immunoassay methods for the estimation of the hormones T4, T3, TSH, Cortisol, testosterone and dehydroepiandrosterone have been established.

FUTURE PROGRAMMES

The thrust will be on development of chemotherapy to combat diseases

like cholera, leishmaniasis and human genetic research and gene therapy.

SPECIAL FACILITIES

INSTRUMENTAL

- Fluorescence activated cell sorter
- Automatic DNA sequencer
- 300 MHz NMR
- Gc-Ms Mass spectrometer
- Transmission Electron Microscope
- Microfermentor
- Electronic Stimulator
- HPLC
- Liquid Scintillation Counter
- Spectrophotometers
- Spectrofluorimeter

INFRASTRUCTURAL

- Animal House

SERVICES OFFERED

- Analytical services and testing facilities as:
- Toxicity test
- Antimicrobial test in vitro
- Genetic toxicology tests
- Reproductive biology related tests
- Immunological tests
- Screening of herbal drugs

TRAINING PROGRAMMES

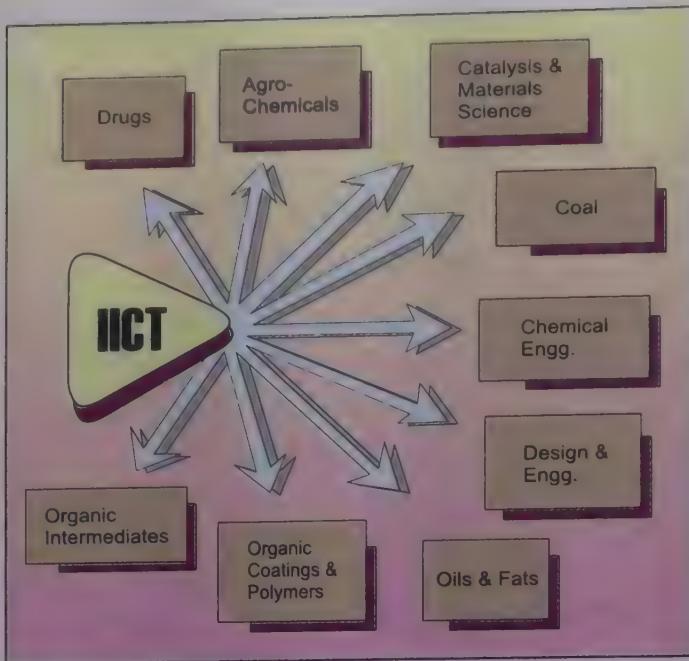
In service and adhoc training programmes.

Students and summer trainees are given training in modern equipment and facilities.

PUBLICATIONS

Annual Report

CONTACT PERSON: Director



Indian Institute of Chemical Technology (IICT)

Uppal Road, Hyderabad 500 007

Telephone: 7173289, 7173403
Telegram: RESEARCH, HYDERABAD

Fax: 7173387, 7173757

E.Mail: kvr@csiict.ren.nic.in

STD Code: 040

Established: 1944 as CLSIR

Taken over by CSIR: 1956 as RRL(H)

Rechristened: 1989 as IICT

Director

Dr K.V. Raghavan

Grant

1998-99

Rs. 2440 Lacs

Manpower

Scientific & Technical : 225

Total: 1060

MANDATE

- To be an innovative global R&D provider in the field of chemical technology with reference to industrial and speciality chemicals.

MAJOR R&D PROGRAMMES

- ★ Relate to agrochemicals, pharmaceuticals, organic intermediates, fine chemicals, lipids/derivatives, specially polymers and allied chemicals, rational design and discovery of new molecules/products, organic synthesis, heterogeneous and homogeneous catalysis and chemical process design, modelling and simulation, science based services in chemical, biological and engineering systems.

for agrochemical and pharmaceutical sectors.

LIPIDS/DERIVATIVES

- A pilot scale continuous process plant (15kg/hr) has been established for pyrolysis of castor oil methyl esters. The process has been licensed to two companies and another party is setting-up of 4.5 t.p.d. 10-undeceneic acid plant.
- A novel, enzymatic degumming method for rice bran oil has been standardized. The IICT and IOC (R&D) Centre are collaborating in developing a wide range of ecofriendly lubricants from oleochemicals.
- A batch process on laboratory scale for preparation of sebacic acid from castor oil has been developed.

SIGNIFICANT ACHIEVEMENTS

- ★ Several global companies like DuPont, CytoMed, Searle R&D have entered into contracts for the synthesis of novel chemical entities



Single tube reactor HFC 134a

AGROCHEMICALS

- The process know-how for pheromone blends of yellow stem borer on 250 gm/bench scale has been established in a joint venture with Directorate of Rice Research Institute to conduct field trials on pheromone lures. Upscaling work

on acephate and esfenvalerate is in an advanced stage.

- Process on the preparation of Lambda Cyhalothrin has been developed on laboratory scale. A mixed formulation consisting of active ingredients from neem and custard apple with high bioefficacy

has been developed as biopesticide and a patent filed.

DRUGS/PHARMACEUTICALS

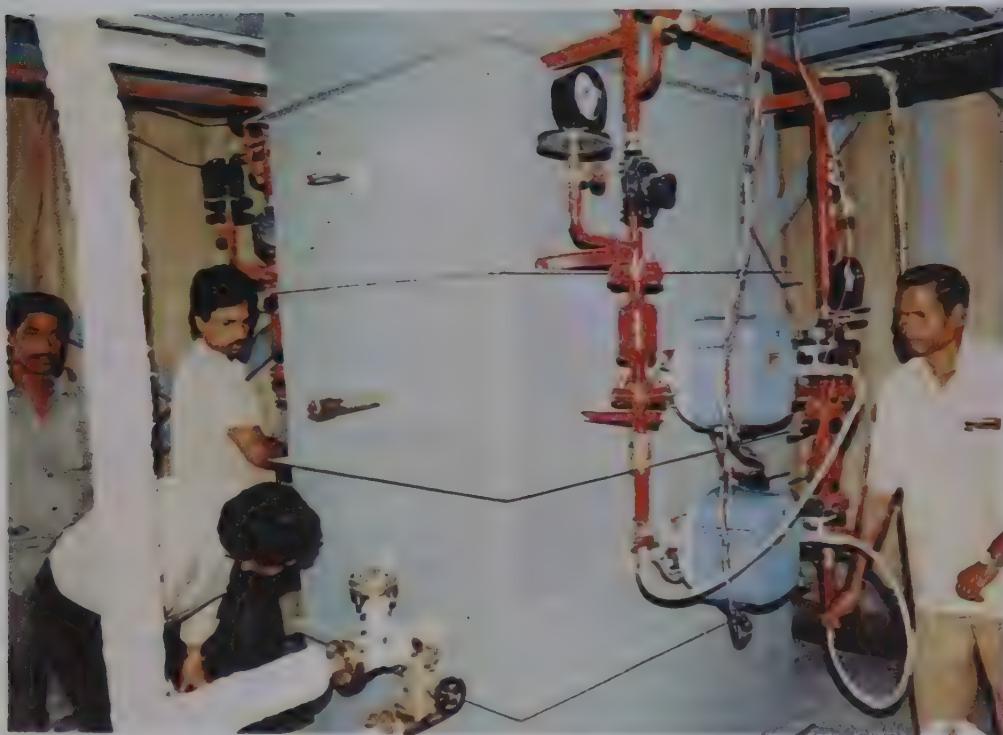
- A process has been developed for conversion of melfloquine to chloroquine, an anti-malarial. It dispenses with the use of alkylolithium reagent. Stuvadine (d uT) process know-how developed is used in conjunction with other anti-AID drugs for the treatment of AIDS.
- Beta Thymidine, the key raw material for an anti-AIDS drug has been licensed to an Indian company. A US patent has been granted for this invention.
- A laboratory process for Taxol, for treating blood cancer has been developed.
- Developed two novel approaches to the synthesis of a candidate molecule for chronic asthma developed by a USA Company.
- As a major step towards the development of natural product based drugs, 18 extracts from natural products were prepared for bioassay studies. More than 120 samples received from other CSIR laboratories have been tested for anti-inflammatory activities.

ORGANIC COATINGS & POLYMERS

- The technologies for polyvinyl acetic emulsion adhesive and synthetic vinyl binder for distempers have been commercialized. These products would be marketed under the trade names of 'Wood Fix', 'Tixi Bond' and 'Supercem Shot'.
- The technology for neoprene based contract adhesive has been commercialized. The trade name of the product is 'Fixsole RA 1001'.
- Technology of cyanoacrylate and isoamyl-2-cyanoacrylate adhesives is in the process of commercialization.



Castor oil processing complex



Pyrolysis of castor oil Methylesters

- The Institute has also demonstrated successfully the following technologies like:
- Ecofriendly pack materials; Pheromone lures; Methacrylate copolymers; PVA emulsions;

Pressure sensitive adhesive; NBCA spray; Pasting gum powder

FLUOROORGANICS

- 1,1,1-trichloro - trifluoroethane (CFC-113a) is a key raw material

for producing highly potent and less toxic pyrethroid class of insecticides like lambda-cyhalothrin. Recent restrictions on the use of CFCs under Montreal Protocol has made its availability difficult for the Indian drug industry. The process know-how for CFC-113a has been developed on pilot scale and successfully demonstrated the same on operational scale of 3 kg/batch.

CHEMICAL AND MECHANICAL ENGINEERING SCIENCES

- Successfully completed the basic engineering of the pilot plant to be set-up at SPIC (Tuticorin). The project is being supported by the PATSER (DSIR).
- Successfully completed the following three detailed engineering assignments:

Ammonia Stripping Plant; Nickel Extraction Plant; Iron Oxide Pigment Plant

- Completed hazard analysis of a LPG bottling plant of BPCL and molten sulphur and liquid ammonia process facilities, safety aspects of chemical handling, identification of accident scenarios, cause and consequence analysis and HAZOP/FTA studies.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

Out of One hundred eighty four technologies transferred to the industries, 139 are in commercial production. The major technologies are includes:

- ★ Monocrotophos; Chlorpyrifos; Glyoxal; Norfloxacin and Ciprofloxacin; AZT; Hydrazine hydrate; Benzyl chloride and related chemicals; Catalyst for hydrogenation of benzene to cyclohexane; Etoposide; Metoprolol and Nadolol; Low temperature carbonization of coal; S-Timolol

maleate; Gemfibrozil; Sodium azide and Technologies for adhesives

FUTURE PROGRAMMES

Development of technologies for environmentally safe pesticides; innovative technologies for life saving drugs; CO-based chemicals; CFC substitutes and other fluorocarbons; catalysts for industrially important chemical processes; and process design and development for bulk organic intermediates. design and engineering of commercial plants and hazard and risk analysis of chemical plants.

SPECIAL FACILITIES

General purpose pilot plant equipment and dedicated pilot plants for scale up studies.

Design and engineering expertise including CAD station

Analysis and testing facilities

Modern instruments for characterization and structural determination of chemicals and analysis

SERVICES OFFERED

Development of technologies on contract basis

Basic/detailed design of commercial plants and commissioning assistance

Analysis and testing facilities for industry

Simulation, optimization and control of process plants

Hazard and risk analysis of chemical and petrochemical plants

Toxicity evaluation of pesticides

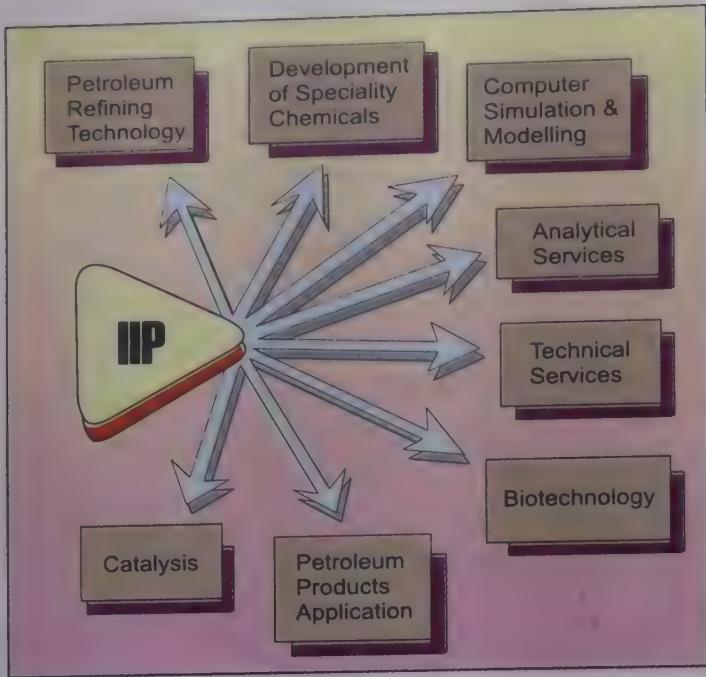
TRAINING PROGRAMME

IICT conducts training programmes on specialized topics in the area of its activities

PUBLICATIONS

Annual Report and IICT Bulletin (Quarterly)

CONTACT PERSON: Director



Indian Institute of Petroleum (IIP)

P.O. IIP, Dehradun 248 005

Telephone: 624508
 Telegram: PETRINST DEHRADUN
 Fax: 671986
 E.Mail: iipddn@del 2.vsnl.net.in
 STD Code: 0135
 Established: 1960

Director (Acting)
 Shri Sudhir Singhal
Grant
 1998-99
 Rs. 1370 Lacs
Manpower
 Scientific & Technical: 485
 Total: 635

MANDATE

- To develop novel, state-of-the- art technologies & products for petroleum refining, chemicals & petrochemicals, application of petroleum products in IC engines and combustion systems
- To conduct market demand surveys and techno-economic Feasibility Studies for related products
- To train technical personnel from petroleum and related industries
- Assist the Bureau of Indian Standards in formulation of standard specifications for petroleum products

MAJOR R&D PROGRAMMES

- ★ The programmes relate to petroleum refining technology, development of separation processes, conversion processes, petroleum products applications, development of chemicals and biotechnology:
- ★ Separation Processes: Aromatic extraction, dewaxing/deoiling, lubes/bitumens, deasphalting and absorptive separations.
- ★ Conversion Processes: Catalytic reforming (SR& CCR), hydrotreating, hydrocracking, fluid catalytic cracking and resin cracking, vis-breaking and delayed coking.

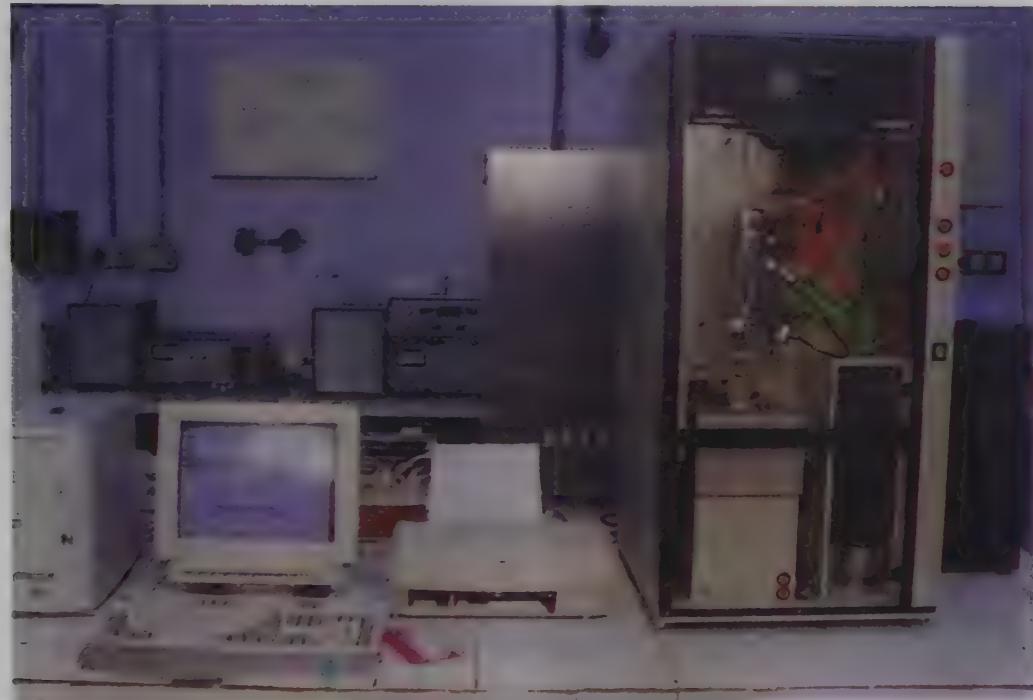
★ Petroleum Products Applications: Alternative fuels, vehicular emissions, performance evaluation, conservation of fuels and lubricants, tribology, industrial burners, domestic appliances, waste disposal through incineration.

★ Chemical Sciences: Process development for additives and intermediates, speciality chemicals, chemicals from biomass and electrochemistry/corrosion.

★ Biotechnology: Microbial enhanced oil recovery and microbial dewaxing.



Hydrocracking pilot plant



ASTM distillation unit

SIGNIFICANT ACHIEVEMENTS & TECHNOLOGY TRANSFERRED

Processes Developed & Transferred:

- Benzene & Toluene through Solvent Extraction of Naphtha
- Food Grade Hexane through Solvent Extraction
- Superior Kerosene/ATF through Solvent Extraction
- Solvent Dewaxing & Deoiling
- Visbreaking Technology
- Delayed Coking Technology
- Catalytic Reforming
- Pt-Re Bimetallic Reforming Catalyst
- Hydrodesulphurisation of Naphtha, Kerosene & Gas Oil

- LOBS through NMP extraction
- Petroleum based electrode pitches
- Pyrolysis gasoline hydrogenation
- FCC catalyst
- Naphtha pretreater
- Simulation package for SR reformers
- Ultra pure hexane
- Re-refining of used crankcase lube oil
- High temperature antioxidants
- Sulfolane production technology
- Alpha olefins from coker distillates
- EP antiwear/antifriction additives

Product Technology:

- Low air pressure film burner
- Kerosine wick stove
- LPG household/commercial stove
- Improved hurricane lantern
- Smoke meter
- Hot rolling oil
- Diesenol retrofit kit
- CNG 3 wheeler conversion kit

SPECIAL FACILITIES

Pilot Plants/Bench Scale Units:

- Dewaxing/Deoiling
- Visbreaking
- Delayed Coking
- Propane Deasphalting
- High Pressure Equilibrium Still
- Catalytic Reforming
- Hydrocracking
- Bench scale fermentor
- Micro reactor for catalyst screening
- Bench scale units for hydroprocessing
- MAT unit for FCC catalysts
- Desulfurisation of fuel gases
- High pressure bench scale unit

Hydrocarbon Analysis:

- Gas Chromatographs
- High Pressure Liquid Chromatograph



Emission Studies—CNG 3-wheeler



Short path distillation unit

- High Resolution GC Mass Spectrometer
- UV, IR, FTIR, NMR spectrometers
- Gel permeation chromatograph
- PIONA analyser
- GC System for RON/MON
- Refinery/Natural gas analyser
- Oxygenate Analyser

- UV-VIS-NIR Spectrometer

Crude & Products Evaluation:

- Automatic TBP Distillation Units
- Simulated GC Distillation System
- Elemental analysers:
- Atomic absorption
- Atomic emission

- Oxidative micro coulometric systems
- XRF sulphur analyser
- Nitrogen analyser
- Automatic titro processor
- Pipe line test rig for corrosion studies
- Spinning band distillation unit
- Automatic ASTM D86 distillation unit
- Automatic freezing point apparatus
- Automatic cold filter plugging point apparatus
- Automatic pour point apparatus
- Short path distillation

Catalyst Characterisation:

- High pressure mercury porosimeter
- Electron spin resonance spectrometer
- X-ray diffractometer
- BET apparatus
- Chemisorption units
- Thermal gravimetric analyser
- TPR & TPD units
- Differential scanning calorimeter
- Laser particle size analyser

Product Evaluation Facilities:

Tribology:

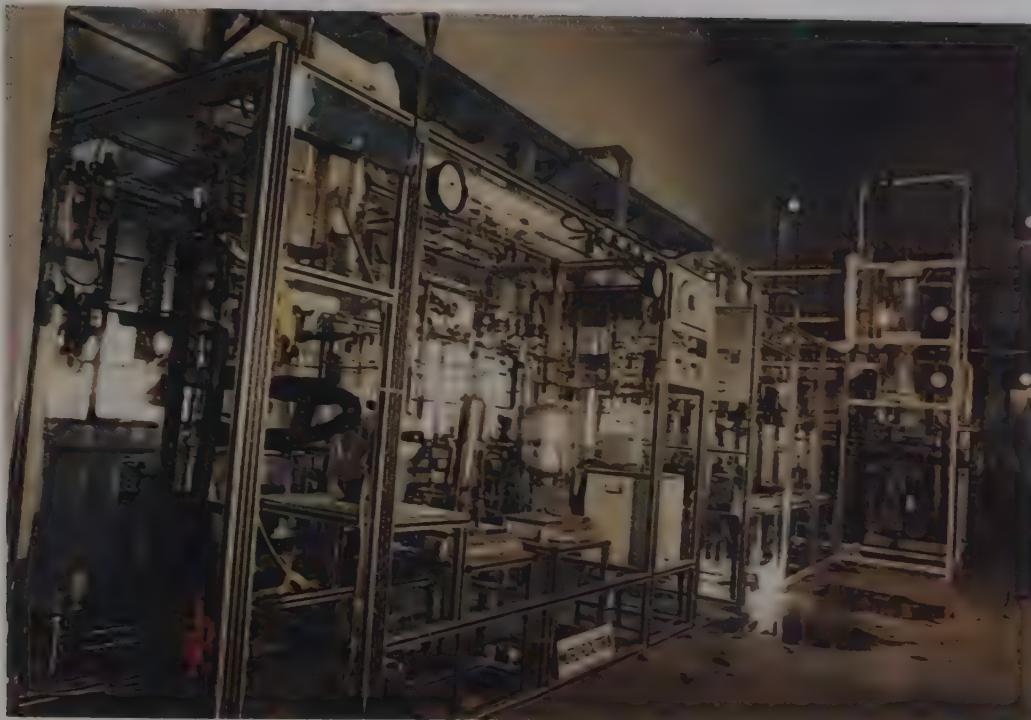
- FZG gear rig
- IAE gear rig
- Amsler disc machine
- Four-ball wear tester
- Four-ball EP tester
- Timken EP tester
- TalySurf
- Scanning electron microscope

Combustion Systems:

- Combustion chambers
- Exhaust gas analysers
- Product evaluation facilities

IC Engines:

- Dynamometers for heavy & light duty vehicles



Micro-reactor for hydrocarbon studies

- High speed camera with 11000 frames/second
- Digital analyser
- Laser droplet size analyser
- Knock intensity meter
- Perthometer for measuring surface roughness
- Programmable engine dynamometers test beds
- Mass emission measurement system
- CLR and caterpillar engines for lube testing
- CFR engines for octane and cetane rating of fuels
- Ricardo hybra research engine
- Combustion bomb for basic studies
- Dilution tunnel for particulate measurements

SERVICES OFFERED

Process & product developmental work for petroleum refining, petrochemicals, additives and speciality chemicals.

Technical services and trouble shooting operations for hydrocarbon industry.

Development of proprietary catalysts

Physico-chemical characterization and evaluation of catalysts for reforming, hydrocracking, hydrodesulphurization, hydrogenation, FCC etc.

Evaluation of crudes and products

Physico-chemical characterization of crudes, products and speciality chemicals

Chemical composition of various products by sophisticated instrumental analytical techniques like GC, mass, UV, IR, NMR, X-ray diffraction, atomic absorption and emission.

TRAINING PROGRAMME

The laboratory conducts sponsored courses for oil and petrochemical industry, it has already trained around 2400 engineers, chemists and technicians so far.

PUBLICATIONS

Annual Report, A quarterly R&D Newsletter.

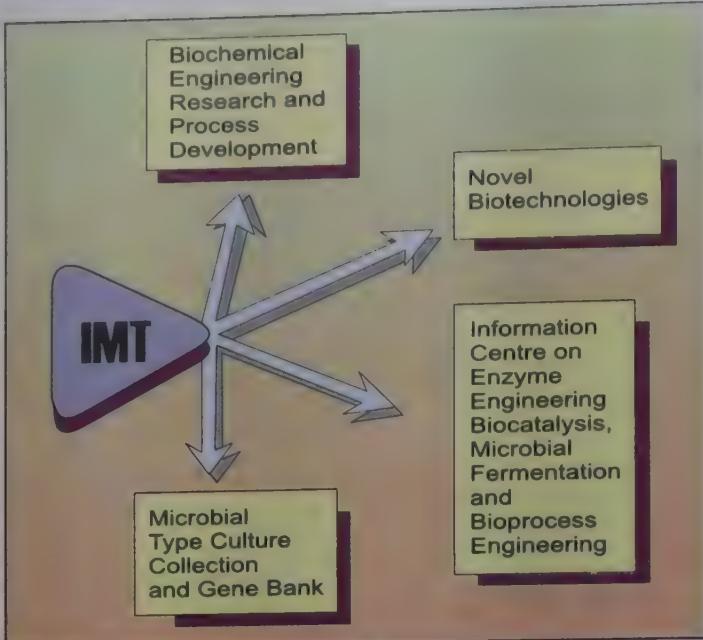
CONTACT PERSON: Director

Field Stations

Indian Institute of Petroleum
CSIR Complex, NPL Campus
Pusa, New Delhi 110012

Tel: 011-5735678/5737348

Fax:011-5737348



Institute of Microbial Technology (IMTECH)

Sector 39-A, Chandigarh 160 036

Telephone: 690908,
690713,690785,690263
Telegram: IMTECH CHANDI-
GARH
Fax: 690585,690632
E.Mail: root@koel.imtech.ernet.in
STD Code: 0172
Established: 1984

Director
Dr Amit Ghosh
Grant
1998-99
Rs. 725 Lacs
Manpower
Scientific & Technical: 45
Total:160

MANDATE

- To provide an integrated research, development and design base for microbial technology
- To undertake basic and applied research and development programmes in established and newly emerging areas of biotechnology including genetic engineering
- To develop and maintain gene pool resources and genetic stocks of microbial cultures and other cell lines
- To impart training in microbiology, microbial technology and biochemical engineering to research workers and technologies

MAJOR R&D PROGRAMMES

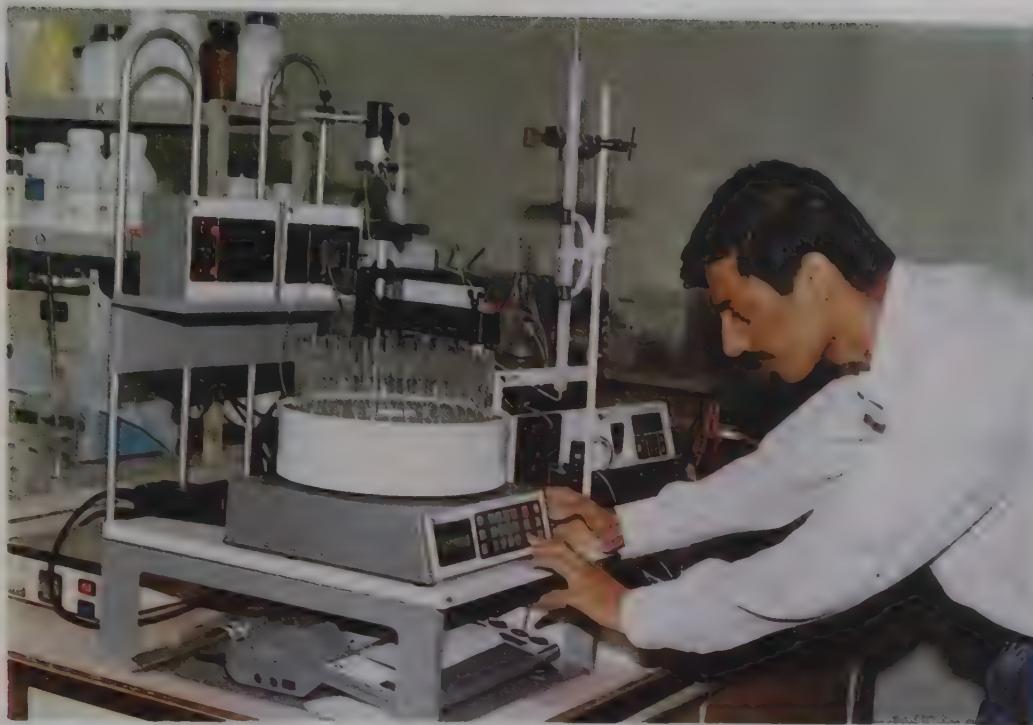
- ★ The programmes lie in the following areas: molecular biology and microbial genetics, animal cell/tissue culture and immunology, protein science and engineering, and fermentation technology.

SIGNIFICANT ACHIEVEMENTS

- ★ Development of commercial processes for the efficient conversion

of molasses to alcohol using osmotolerant, ethanol-tolerant and flocculent strains of yeast

- ★ Development of knowhow for enzymatic conversion of rifamycin B to rifamycin S
- ★ Development of a simplified process for purification of urokinase from urine
- ★ Development of a oral cholera vaccine which is under clinical trials



DNA synthesizer in operation



Protein purification system being used

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Fermentative production of ethanol from an improved strain of *Saccharomyces cerevisiae*
- ★ Enzymatic conversion of rifamycin B to rifamycin S
- ★ Production of Urokinase from human urine

FUTURE PROGRAMMES

Emphasis to be on the areas of protein science and engineering and yeast genetics.

SPECIAL FACILITIES

- Scanning & transmission electron microscopes
- Ultra and superspeed centrifuges
- HPLC/FPLC and gas chromatograph

- Protein sequencer & protein synthesizer
- Fermentation pilot plant (1500 litre) and associated down stream processing equipment
- Modern facilities for identification, preservation and maintenance of microorganisms
- X-ray crystallography

BIOCHEMICAL ENGINEERING RESEARCH & PROCESS DEVELOPMENT CENTRE (BERPDC)

- To help develop microbial processes upto industrial scale for useful products, the Centre has several laboratory scale fermenters, a 150 litre fermenter and a computer-controlled 1500 litre fermentation pilot plant. The plant, only one of its kind in India, is integrated upstream with media preparation vessels and downstream with a centrifugal separator and a cell homogenizer. The Centre has sophisticated membrane based down stream processing equipment.

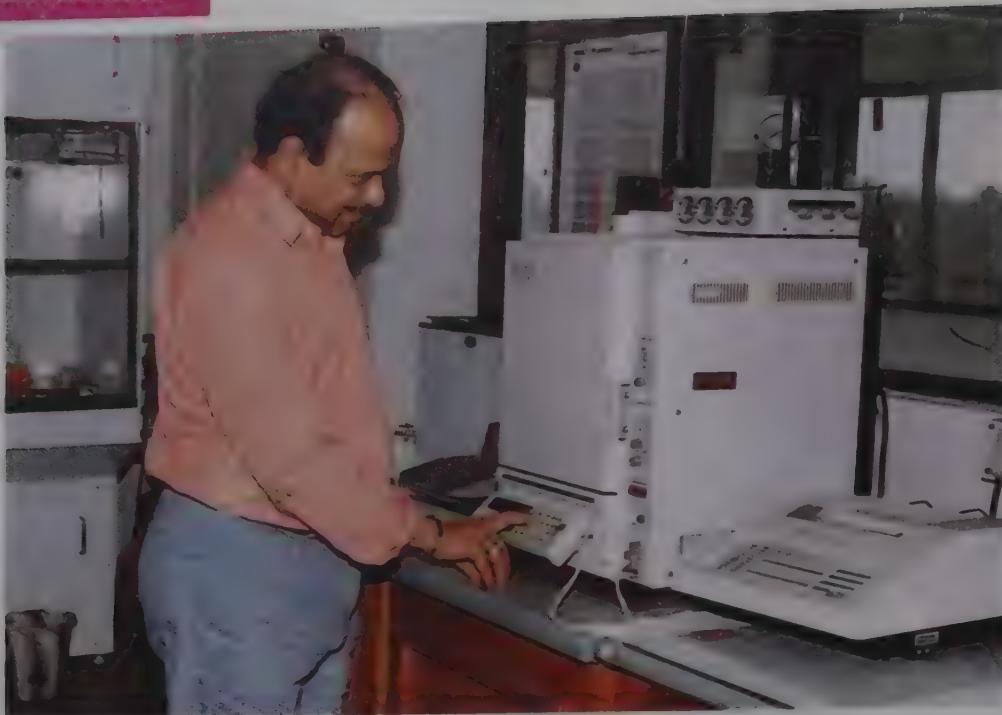
MICROBIAL TYPE CULTURE COLLECTION & GENE BANK (MTCC)

- The Centre has five sections, namely, actinomycetes, bacteria, fungi, yeasts and plasmids. Relevant information about the strains held in MTCC is computerized for easy search, analysis and retrieval.

DISTRIBUTED INFORMATION CENTRE (DIC) ON PROTEIN ENGINEERING

- DIC is a part of the Biotechnology Information System (BTIS). Its aim is to interlink all the specialized centres through a national bio-information network.

IMTECH



CHNS analyzer in use

SERVICES OFFERED

The Institute undertakes contract work for development of microbial processes for useful products.

TRAINING PROGRAMMES

IMTECH has linkages with various academic institutions and is conducting courses:

Two-year M.Sc. (Biotechnology) programme in collaboration with Panjab University, Chandigarh

Ph.D. programme in association with Jawaharlal Nehru University, New Delhi

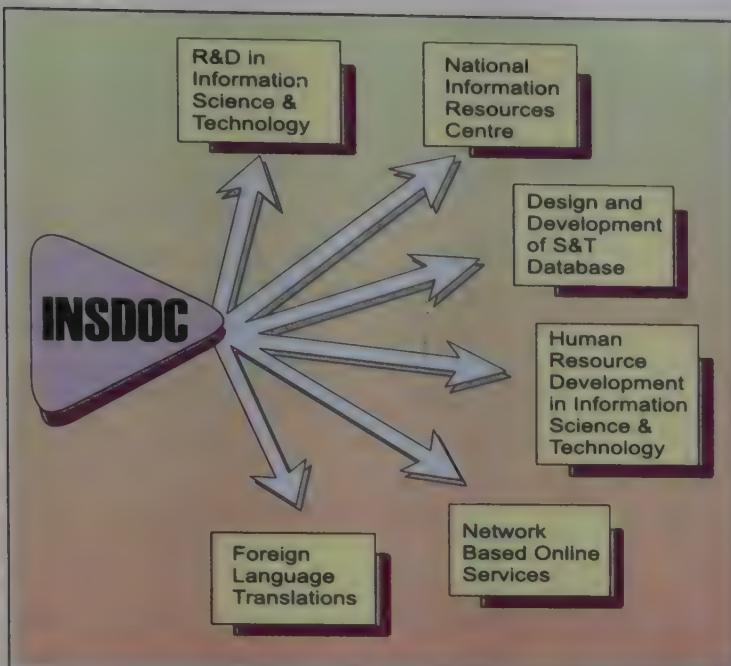
Imparts summer training to M.Sc. (Biotechnology) students from various universities

Intensive short-term training courses organized periodically on various aspects of biotechnology. Courses have been organized in genetic manipulations, separation techniques, molecular genetics of yeast, molecular genetics of streptomyces, selective isolation and identification of actinomycetes, modern analytical approaches to the development of fermentation processes and basic microbiology.

PUBLICATIONS

Annual Report

CONTACT PERSON: Director



Indian National Scientific Documentation Centre (INSDOC)

14, Satsang Vihar Marg,
New Delhi 110 067

Telephone: 6515837, 665072
Telegram: INSDOC NEW DELHI
Fax: 6862228
E.Mail: teevee@sirnetd.ernet.in
STD Code: 011
Established: 1952

Director

Prof. T. Vishwanathan
Grant
1998-99
Rs. 660 Lacs
Manpower
Scientific & Technical: 50
Total: 265

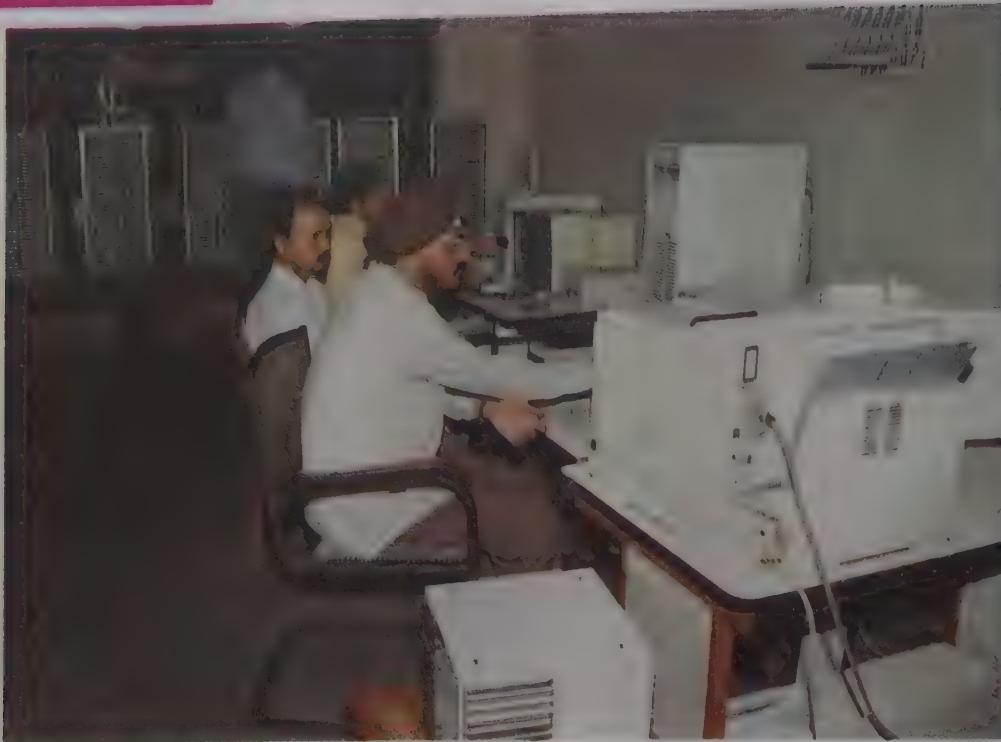
MANDATE

- To develop collections of sources of information in different fields of science and technology
- To render information services to S&T community in the field of science and technology
- To develop appropriate linkages with the information systems and services organised in India and abroad and to provide access to databases
- To act as a national repository of entire S&T information generated in the country
- To carry out R&D in information science and technology
- To develop trained manpower for undertaking advanced level tasks in the field of information science and services

MAJOR R&D PROGRAMMES

- ★ Design and development of S&T databases including multimedia databases
- ★ Network - based information services
- ★ Production of CD-ROM products

- ★ R&D in information science and technology
- ★ Foreign language translations
- ★ Human resource development in information science and technology
- ★ Setting up of electronic libraries and classrooms



Scientist working at INSDOC library

SIGNIFICANT ACHIEVEMENTS

- ★ Computerised communication network called SIRNET (Scientific and Industrial Research Network) linking R&D organisations and other institutions has been established and is operational providing services like E-Mail, data transfer and database access.
- ★ Established an online search facility from international and indigenous databases. The indigenous databases available for search are: National Union Catalogue of Scientific Serials in India (NUSSI), Indian Serials Contents on Multi-Media (ISCOMM), Polymer Science Literature, Database on Indian Patents (INPAT), Medicinal and Aromatic Plants Abstracts (MAPA) Database, Material Science Bibliographic Database and National Science Library catalogue.
- ★ Developed a Library automation package called Granthalaya. The package a modular in design, supports object-orientation and con-

forms to Common Communication Format (CCF).

- ★ A service, 'Contents, Abstracts and Photocopies Service' (CAPS) based on a set of nearly 7000 S&T periodicals has been devised to meet the shortage of foreign periodicals.
- ★ Electronic imaging has been set up as a modern archival alternative to microfilming.
- ★ Two CD-ROM products, namely, National Union Catalogue on Scientific Serials in India (NUSSI on CD-ROM) and Indian Patents (INPAT on CD-ROM) have been brought out.
- ★ Setting up of Electronic Library containing over 3,000 journals, patents and conference proceedings on CD-ROM.
- ★ The Full Text Journal Service (FTJS) has been introduced with an aim to alleviate the problem of libraries.
- ★ The Indira Gandhi National Open University (IGNOU) has identified INSDOC as the Programme Study Centre for various courses in the

field of Library and Information Science and Computer Science.

- ★ The SARRC Documentation Centre (SDC) set up at INSDOC for exchanging S&T information among SAARC nations. SDC conducts various training programmes including short term attachment training and workshops in the field of library and information science.

FUTURE PROGRAMMES

National Information Resource Centre: INSDOC will strengthen its information resource base by acquiring important foreign core periodicals for supporting a fast document delivery system.

Turnkey Projects in Library Automation and database creation: INSDOC will strengthen its expertise in the latest aspects of library automation, information handling and database creation.

R&D in Information Science and Technology: INSDOC will strengthen its R&D programmes in information science and technology, especially in areas like CD-ROM technology, multimedia based information systems, software engineering, electronic imaging, electronic libraries, etc. Initiatives have been taken to convert existing information in libraries into electronic form and move towards digital libraries.

SPECIAL FACILITIES

Networking and electronic mail; Online database host system; National Science Library; Electronic imaging for archival purposes; Infotech laboratory; Electronic Library

SERVICES OFFERED

Document copy supply; Literature search from international/national databases; Foreign language translation/interpretation; Retrospective conversion of library holdings into machine readable form; Contents, Abstracts and Photocopies Service (CAPS); Microfilming and slide-mak-

ing; Desk top publishing and offset printing; Creation of databases and compilation directories; Electronic imaging of archival records; Standing order Abstracts Service (SOAS); Chemical Abstracts Keyword Index Service (CAKIS); Full Text Journal Service (FTJS)

TRAINING PROGRAMMES

An advanced two-year post-graduate course in the field of information science, a number of short-term and attachment training courses on topics like computer applications to library and information activities, CDS/ISIS, bibliometrics, information technology, online information re-

trieval, database management systems, Internet and UNIX.

PUBLICATIONS

Annual Report
 Indian Science Abstracts (semi-monthly)
 Annals of Library Science and Documentation(quarterly)
 SDC Newsletter (quarterly)
 CSIR Research Output (annual)

CONTACT PERSON: Director

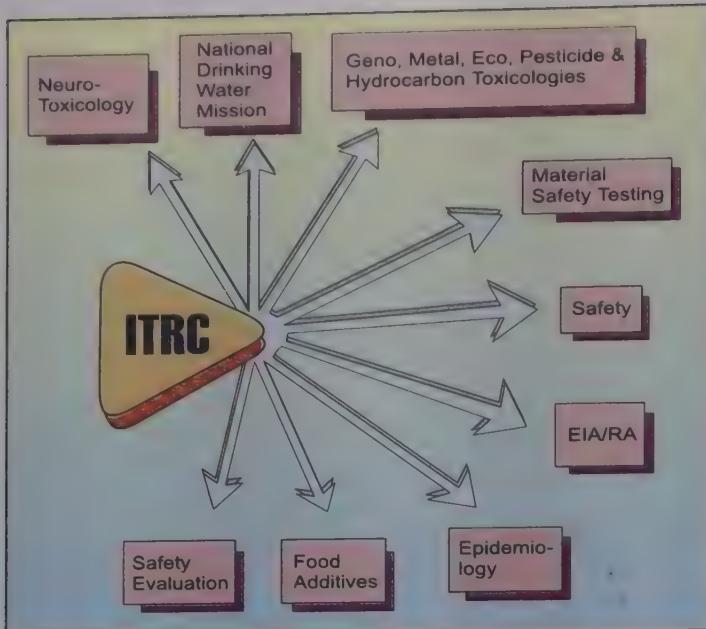
Field Stations

INSDOC Regional Centre
 IISc Campus,
 Bangalore 560012
 Tel:(091)80-3341461,3343554

Telegram: CARE SCIENCE
 E.Mail: root@sirneb.ernet.in

INSDOC Regional Centre
 IICB Campus,
 4 Raja S.C. Mullick Road
 Kolkatta 700032
 Tel:(091)33-4733583
 Telegram:CARE LIVINGCELL
 E.Mail:root@sirnetc@sirnetd.ernet.in

INSDOC Regional Centre
 CSIR Complex, Taramani
 Chennai 600113
 Tel:(091)44-2351453
 Telegram:CARE CONSEARCH
 Fax:(091)44-2350177
 E.Mail:root@sirnetm.ernet.in



Industrial Toxicology Research Centre (ITRC)

Mahatma Gandhi Marg, Post Box No.80, Lucknow 226 001

Telephone: 228227, 221856, 211547

Telegram: INTOXI, LUCKNOW

Fax: 228471, 228227

E.Mail: intox@itrc.sirnetd.ernet.in
pks@itrc.sirnetd.ernet.in

STD Code: 0522

Established: 1965

MANDATE

- To Identify health hazards due to exposure to chemicals in industries, mines, agricultural fields and general environment and undertaking health and environmental surveys
- To study of the mode of action of toxic chemicals/pollutants
- To develop simple/rapid diagnostic tests for disorders caused by industrial and environmental chemicals
- To evaluate safety of chemicals used in industry, agriculture and everyday life
- To suggest remedial/preventive measures to safeguard health and environment from pollutants

Director

Dr P.K. Seth

Grant

1998-99

Rs. 975 Lacs

Manpower

Scientific & Technical: 105

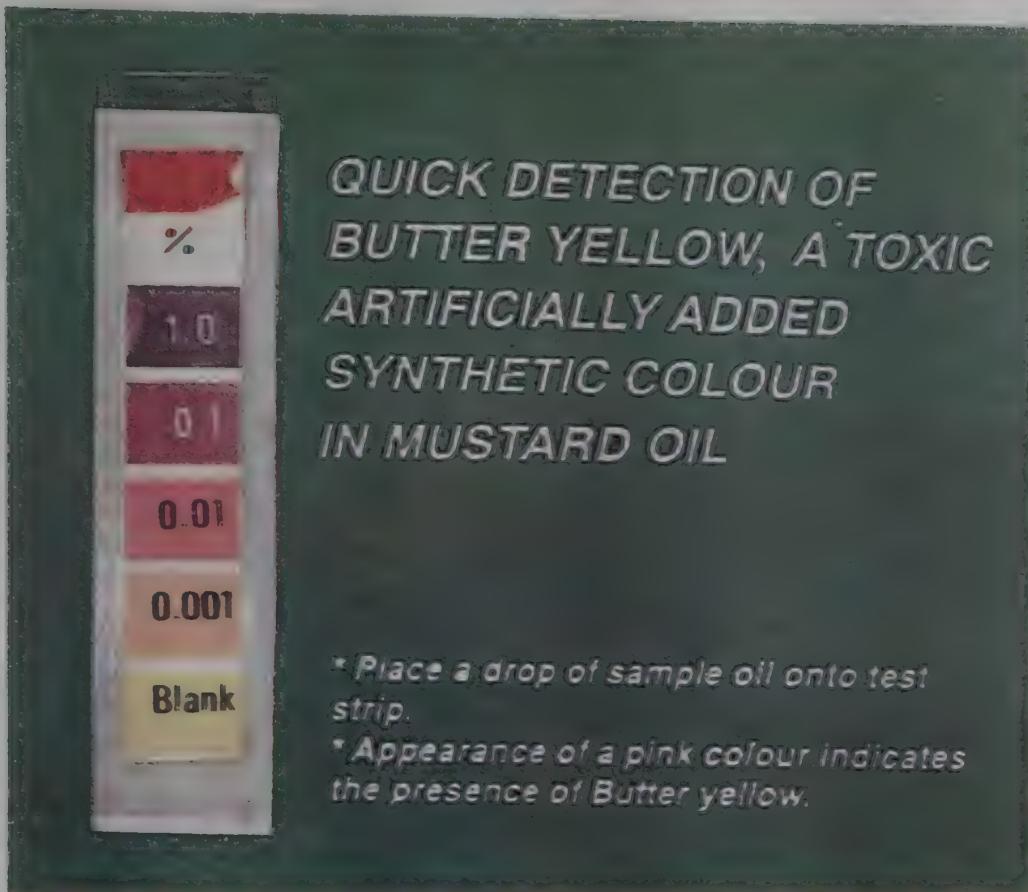
Total: 330

MAJOR R&D PROGRAMMES

- ★ Health Risk Assessment
- ★ Preventive Toxicology
- ★ Predictive Toxicology
- ★ Environmental Toxicology
- ★ Inhalation Toxicology
- ★ Analytical Toxicology

SIGNIFICANT ACHIEVEMENTS

- ★ Demonstrated the ability of some chelating agents in abrogating the toxicity due to metals and immunomodulators in case of solvents and monomers in animal models.
- ★ Vitamin B complex supplementation has been found to diminish susceptibility to lead and cadmium intoxication.



CD-Strip (Detection of butter yellow, a toxic artificially added synthetic colour in mustard oil)

- ★ Completed a major ecoepidemiological risk assessment of mercury in Rihand area.
- ★ Preparation of specific antibodies useful for the diagnosis of anorexia.
- ★ Established the role of cytochrome P 450 in quinalphos toxicity in rats.
- ★ Established platelets as peripheral marker for CNS toxicity.
- ★ Studied on the restorative potential of neural transplants showed that multiple site fetal neural transplantation are more successful than single macrotransplantation in trimethyltin (TMT) induced hippocampal degeneration.
- ★ Validated multispecies tests for ecotoxicological risk evaluation of pollutants. Humic acid was found to reduce the bioavailability and uptake of lindane.
- ★ Isolated a bacterial strain EL-1 capable of degrading all the four isomers of lindane, a chlorinated pesticide of low bioavailability.
- ★ Developed a low cost a efficient defluoridation technology for potable water and computer based mathematical model with user friendly software for predicting the behaviour of industrial chemicals in the environment.
- ★ An ingredient of mosquito repellent was found to exert cytotoxic effect in rats.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Amrit Kumbh - a low cost water purification device
- ★ Portable Water analysis Kit
- ★ Colour detection strip (CD-strip) for quick detection of toxic butter yellow in mustard oil

- ★ Mobile Laboratory Van

TECHNOLOGIES READY FOR TRANSFER

Bact-O-Kill—an electronic device for disinfection of water

FUTURE PROGRAMMES

R&D efforts are to be concentrated on four high priority programmes viz. Human Exposure and Health Risk Assessment, Target Organ Toxicity, Development of new intervention strategies and alternatives to animals in toxicological research and testing.

SPECIAL FACILITIES

Facilities for safety evaluation of chemicals, materials

Animal House

Modern instrumentation facilities for analytical toxicology

Waste water analysis laboratory

SERVICES OFFERED

Health and environmental monitoring; Consumer safety; Toxicity testing; Analytical testing; Information services in the field of toxicology

TRAINING PROGRAMMES

Training is imparted in the areas of water quality assessment

PUBLICATIONS

Annual Report

Industrial Toxicology Bulletin

Abstracts of Current Literature in Toxicology

Manual for safety evaluation of chemicals

Toxicology Map of India - Vol 1 Pesticides

Disaster Preparedness in Chemical Industry

Toxicity Data Handbook vol 1, 2, 3 and 4

ITRC Manual for Metal Analysis in Water

Analysis of Pesticide Residues in Water

International Conference on Pesticides: Toxicity, Safety and Risk Assessment

Bacteriological Map of India in relation to Rural Drinking Water

★ Toxicology Atlas of India

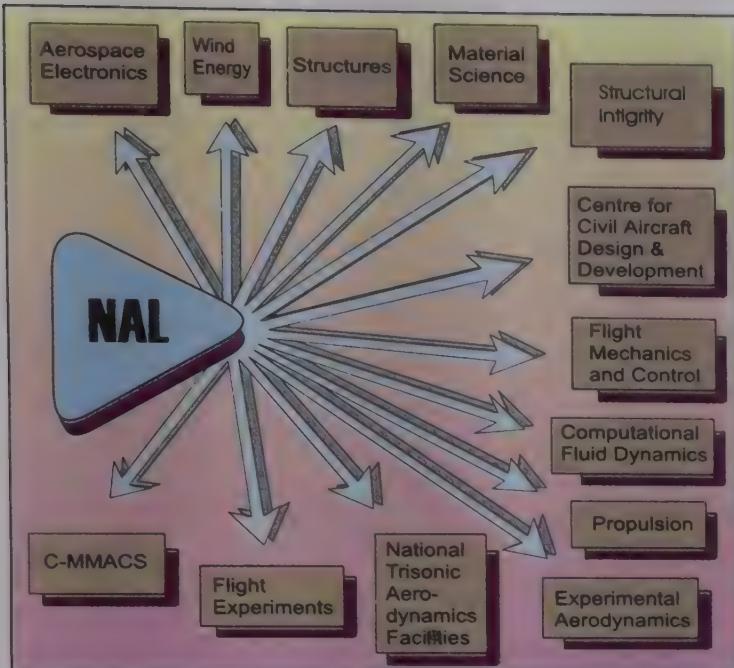
★ Carcinogenic Effects of Pesticides

CONTACT PERSON: Director
Field Stations

ITRC Gheru Campus,
Gheru, Lucknow-Kanpur Road,
Lucknow.

Tel: 091-522-436077, 436144

Fax: 0522-436151



National Aerospace Laboratories (NAL)

P.B.1779, Bangalore 560 017

Telephone(Kodihalli):
5270584,5265579,5271112
5273351-54
Telephone 5279611-18,5263219
Telegram: NAEROLAB,
BANGALORE
Fax: 5260862,5270670,5267781
E.Mail: prahlad@css.cmmacs.
ernet.in; prahlad@csnal.ren.nic.in
Internet: <http://www.cmmacs.ernet.in/nal>
STD Code: 080
Established: 1959

Director
Dr T.S. Prahlad
Grant
1998-99
Rs.4140 Lacs
Manpower
Scientific & Technical: 330
Total:1265

MANDATE

- To develop aerospace technologies with a strong science content with a view to their practical application to the design and construction of flight vehicles and to use this technology base for general industrial applications.
- To achieve High standards in aerospace research, design, development and testing to meet the continuing demands of customers, and provide reliable, value-added, cost -effective and eco-friendly products, spin-offs and services.
- To maintain and operate major national aerospace facilities.

MAJOR R&D PROGRAMMES

- ★ Civil aviation, computational fluid dynamics, experimental aerodynamics and wind tunnel testing
- ★ Flight mechanics and control
- ★ Flight experiments
- ★ Propulsion
- ★ Composites
- ★ Structural design
- ★ Analysis and dynamics
- ★ Structural testing and integrity
- ★ Materials
- ★ Surface modifications
- ★ Aerospace electronics and systems
- ★ Parallel processing
- ★ Wind energy
- ★ Manufacturing technology and
- ★ Information technology



HANSA-3 prototype II in the course of its inaugural flight



Room temperature vacuum bag moulding technology developed for HANSA fabrication

SIGNIFICANT ACHIEVEMENTS

★ Design, development, fabrication and testing of trainer aircraft HANSA aircraft, made entirely out of composite materials. Three HANSA aircraft have been successfully developed and test flown. The aircraft is being produced and will be marketed by

TAAL. Achieved a weight reduction of about 100 kg in prototype II to comply with the JAR-VLA certification requirement.

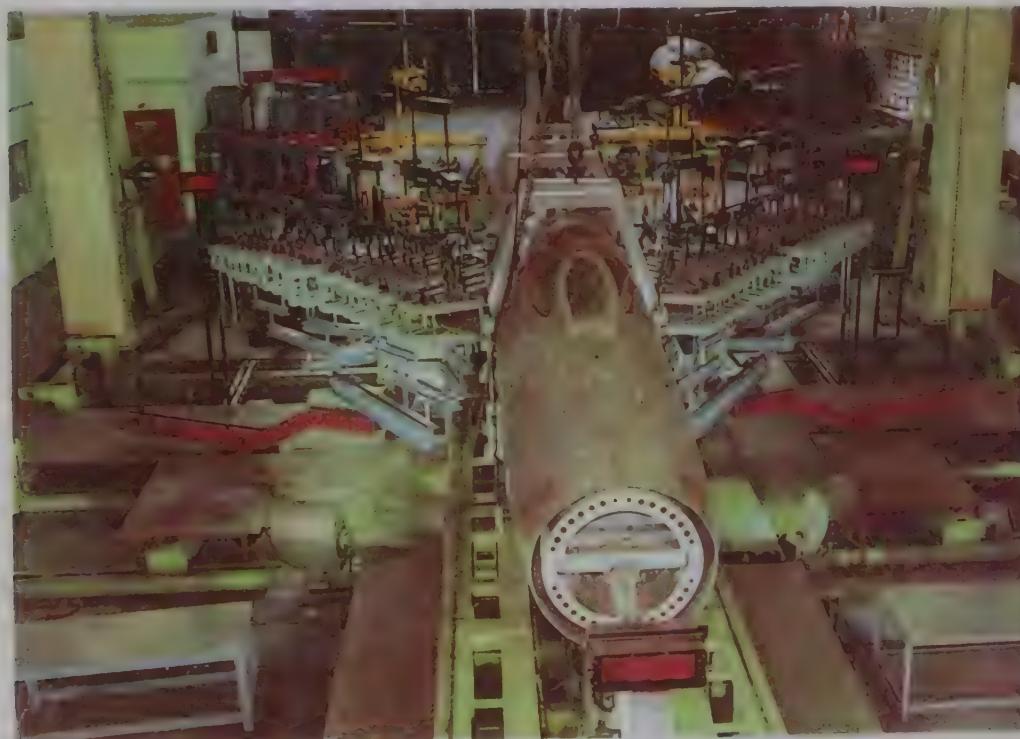
★ Detailed design of the SARAS multirole light 10-14 seater transport aircraft with pressurised cabin for use by the executive and as commuter, air ambulance, cargo

and many other versions. SARAS, to be developed in partnership with HAL, TAAL, KIPL, CMERI, SERC-C and ASTE, is expected to fly in the year 2000.

- ★ Design and development of composite fins for LCA using the co-cured co-bonded technology. Fabrication of LCA rudder, wing spars and landing gear using composite structures. Involvement in the development of the LCA fuselage.
- ★ Development of prepreg (unidirectional resin-impregnated carbon fibre tape) technology and its transfer to IPCL, Vadodara. There pre-pregs can be stored at 25°C for 90 days. High temperature prepreg version for electrical installations (in partnership with Ballarpur Industries Ltd.) has been fully certified in India and USA.
- ★ Completion of the first phase of two contracts from Boeing Airplane Co., USA in the areas of flow relaminarization and damage tolerance studies on lug joints.
- ★ Development and validation of the LCA flight control law, including its inflight simulation, as a part of the LCA National Team work.
- ★ Completion of 22,000 blowdowns at the 1.2m trisonic wind tunnel. Wind tunnel in the lab has played a key role in every Indian aircraft, space and missile programme.
- ★ Delivery of India's largest (4mX8m) computer-controlled autoclave to HAL in partnership with BHEL, Trichy.
- ★ Development of rough diamond coatings for abrasive applications. Technology involving diamond grown by chemical vapour deposition (CVD), is likely to replace diamond + metal or diamond + resin for cutting, grinding and polishing applications.



NAL's flight simulator which was extensively used in the LCA control law development



The fullscale fatigue testing facility which will play a major role in a new NAL-IAF programme to evolve life extension strategies for Indian Military aircraft

- ★ Winning two international contracts for software parallelization and optimisation. The first contract, from IBM Corporation, USA, involved the parallelisation of a weather prediction code (jointly with IISc.); the second contract, from Hitachi, Japan involved a

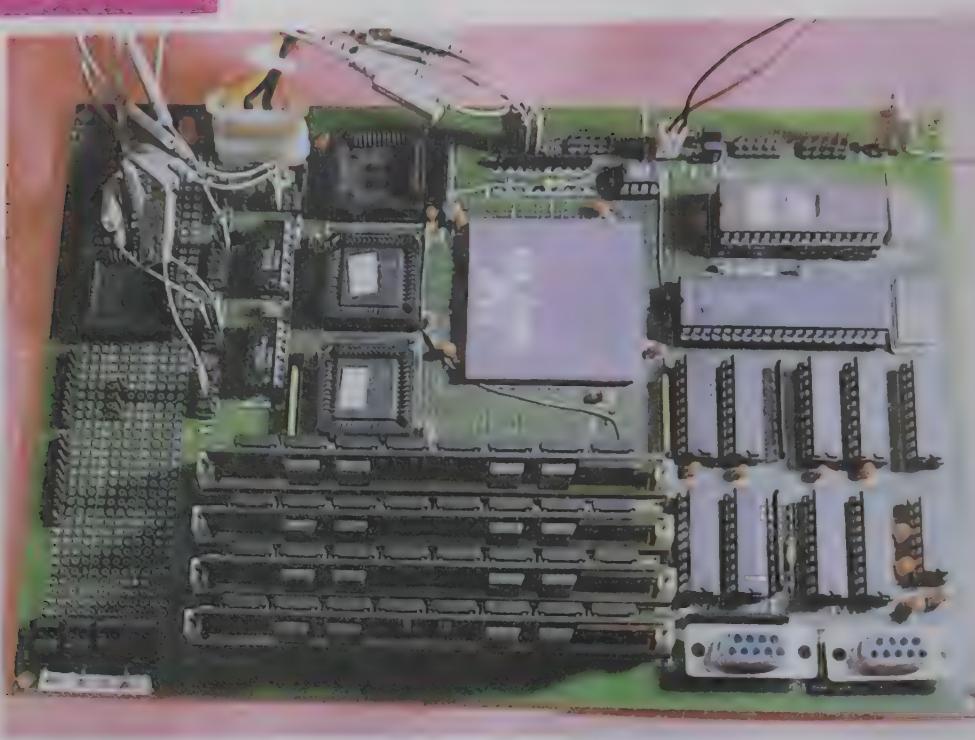
similar exercise for a quantum mechanical code (jointly with TEIL).

- ★ Development of an advanced ramjet combustor for future launch vehicle applications.
- ★ Development of a powered hang glider, Altair, based on the Wankel rotary engine.

- ★ Development of CFD software to handle multiple strap-on configurations for launch vehicles and to analyse turbulent flow around naval vessels.

TECHNOLOGIES READY FOR TRANSFER

- ★ Ultra-high speed tin plating bath for manufacture of the plated wire used in resistors and capacitors.
- ★ Black chromium plating bath for solar energy utilization
- ★ Process for preparation of chromium dioxide powder for magnetic recording tapes for audio, video, instrumentation and computer applications
- ★ Process for descaling diesel locomotive engine components
- ★ 3D coordinate measuring machine for accurate measurement and inspection of engineering components
- ★ Technology for the production of autoclaves
- ★ Automatic visual range assessor (AVRA) for monitoring visibility of airports and highways
- ★ Electrochemical machining equipment
- ★ Electrochemically-assisted arc machine for cutting billets, bar stocks etc.
- ★ Wind powered battery charger for applications in remote areas.,
- ★ Aerodynamic straight foil bearings for textile applications
- ★ FEPACS-finite element software for the analysis of structures
- ★ Novel process for synthesis of high purity alumina suitable for manufacture of electronic ceramics and technical ceramics
- ★ Process for making low density alumina hydrate fillers for paper and printing ink industry



The new hardware board of a high performance CPU without secondary cache developed with support from the CSIR New Idea Fund



The INSAT 2D ready for acoustic test facility

- Integrally geared multistage industrial centrifugal compressor package for oil free plant air supply

FUTURE PROGRAMMES

With technology as the central bedrock theme, NAL's focus shall be oriented towards civil aviation (SARAS and HANSA programmes), support to national aerospace (aircraft, space and missile) programmes, self-sustenance, spin-off technologies and nurturing international partnerships and linkages. NAL is also moving towards network-based information systems and ISO 9001 certification.

SPECIAL FACILITIES

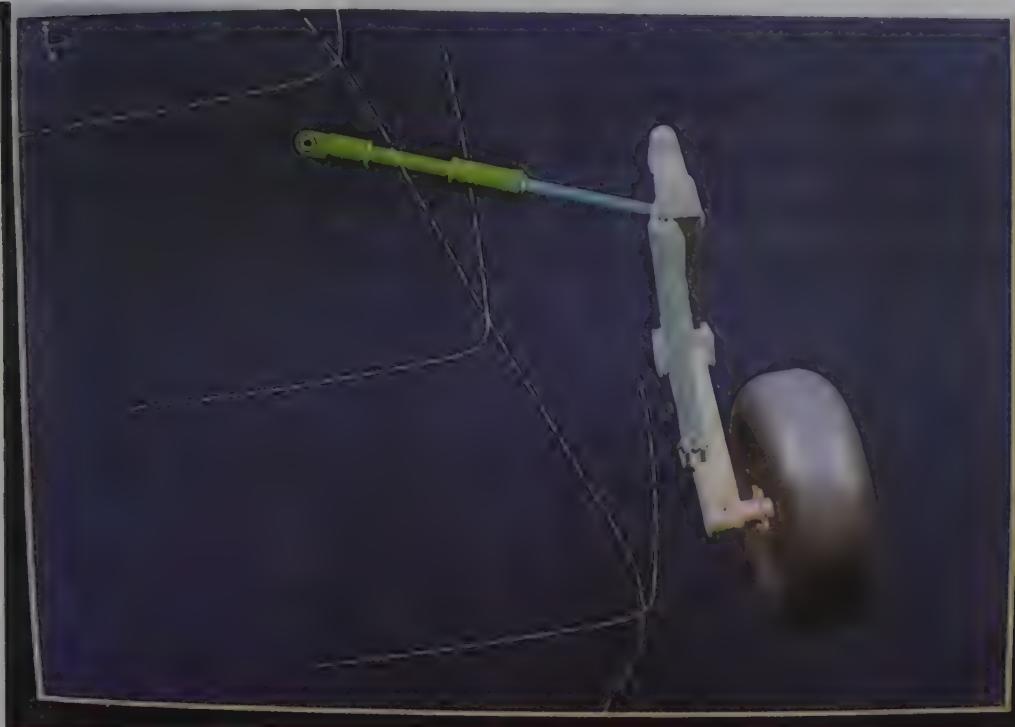
Nilakantan National Trisonic Aerodynamic Facilities (NTAF) has three (1.2m, 0.6m and 0.3m square) high speed wind tunnels and associated model making and data acquisition systems. Every Indian aerospace vehicle has graduated out of this facility.

Fullscale Fatigue Test Facility has 24-actuators and controls to simulate service loading, 96 channels of data acquisition and other associated facilities. This facility is used to support the structural life extension programmes of IAF aircraft.

Composite Structures Laboratory, with all the necessary infrastructure (water jet cutter, prepreg cutting machine, C-scan facility, clean room etc.) chiefly works on the light combat aircraft (LCA) airframe. The Laboratory also includes two large computer-controlled autoclaves.

Acoustic Test Facility(ATF) with a reverberation chamber of 1100 cu m, and an achievable overall sound pressure level of 157dB has been the bedrock of acoustic qualification of all ISRO's satellites and launch vehicles.

NAL is recognised as a centre for failure analysis and accident investi-



A typical CATIA output of the SARAS landing gear

gation for both the aerospace and general industries.

TRAINING PROGRAMMES

The NAL-UNI Lecture Series features course work, case studies,

practical demonstrations and tutorials in different areas of aerospace research. 2-3 NAL-UNI lecture programmes are organised every year. The Computer Support and Services Division runs round-the-year training programmes in information science and technology; the FRP Pilot Plant conducts annual training programmes for small scale entrepreneurs on FRP moulding.

PUBLICATIONS

Annual Report, NAL brings out a Weekly Calendar of Events, the Information Pasteboard (Weekly), NAL News (Quarterly), a quarterly house magazine called Hansa Vani. NAL also publishes four categories of internal reports (200 titles every year) and the twin monthly publications CARA and CABA carrying updates of new aerospace reports and books.

CONTACT PERSON: Director

CSIR Centre for Mathematical Modelling and Computer Simulation (C-MMACS)

NAL Belur Campus,
Bangalore 560 037

Telephone: 5274667, 5274649
Fax: 5260392
E.Mail: rnsingh@cmmacs.ernet.in
Internet: <http://www.cmmacs.ernet.in>
STD Code: 080
Established: 1988

Scientist-in-Charge (Acting)
Dr Anand Kumar
Grant
1998-99
Rs. 73 lacs

MANDATE

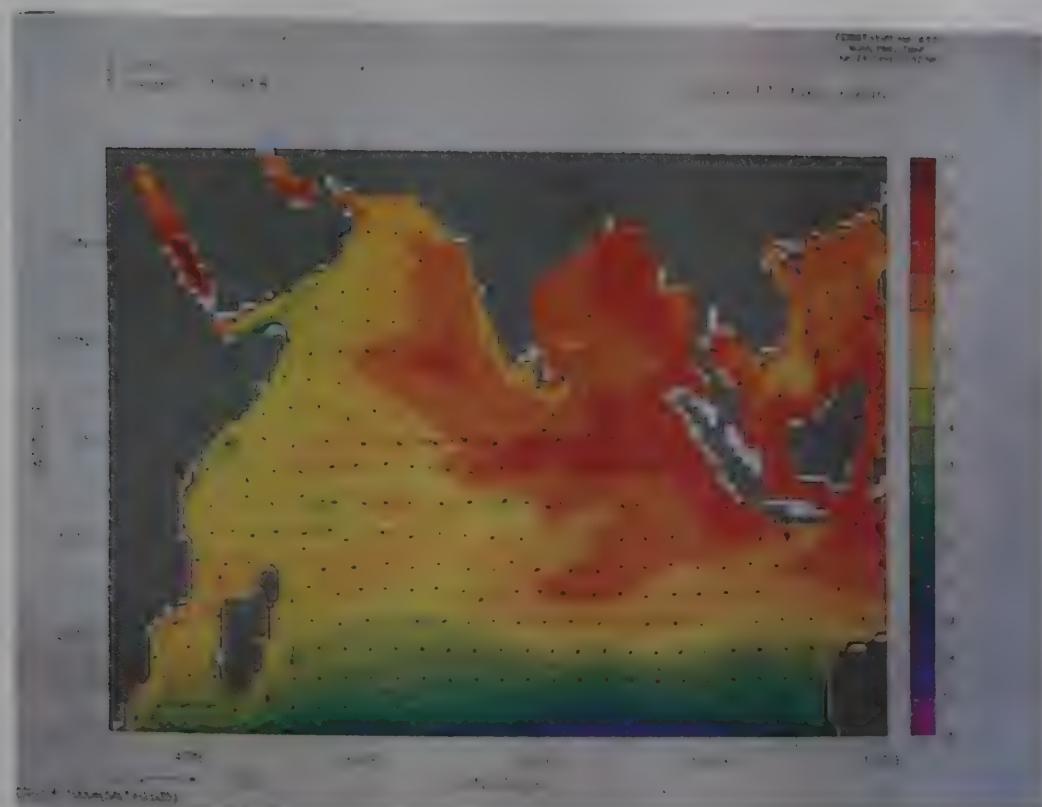
- To develop and provide modelling and computer simulation expertise and facilities for a wide class of natural and engineered systems.
- To catalyze, support and strengthen the wide gamut of scientific programmes in CSIR laboratories by providing creative new approaches to the design and analysis of complex systems through mathematical modelling and computer simulation.
- To design and organize specialized scientific meetings, workshops and training courses to articulate new ideas and propagate advanced methods in mathematical modelling and simulation.

MAJOR R&D PROGRAMMES

- C-MMACS's major R&D programmes include modelling of resources, climate, environment, hazard quantification, and non-linear dynamical systems; computer - aided study and design of engineering systems.

SIGNIFICANT ACHIEVEMENTS

- GPS Geodetic surveys for monitoring strain accumulation in Himalaya and Indian Peninsula.
- Development and testing of an advanced version of the coastal circulation/pollution model



Potential temperature (deg C)

incorporating realistic tides, flooding of mudflats and bathymetry.

★ Development of new algorithms for evaluating sea surface temperatures from NOAA 11 and 12 satellites based on an extensive analysis of climatological radiosonde data and the use of an accurate radiative transfer model.

- ★ Successful porting of a state-of-the-art large scale ocean circulation code (Modular Ocean Model) to the Convex 3820 super computer with incorporation of realistic topography wind forcing and initial conditions and quantification of the Indian ocean climate.
- ★ Successful simulation of the complex interplay between several

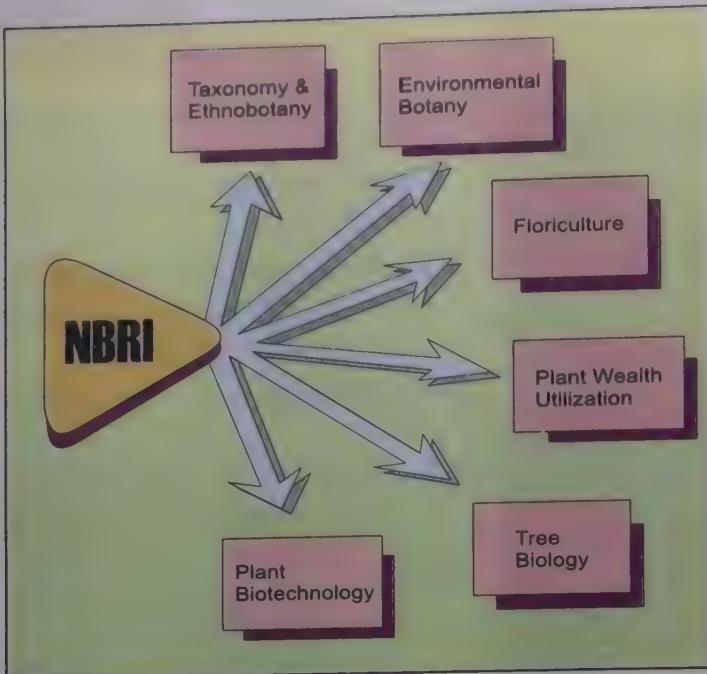
components of a marine ecological system with a 7-component model for a selected station in the Arabian Sea.

- ★ Modelling of the effect of SST on the onset and identification of cyclones in the Bay of Bengal.
- ★ Bioremediation of contaminated soil.
- ★ Development of chaotic encryption techniques, nonlinear time series analysis, and chaotic synchronisation. Modelling of Biochemical Oscillations.
- ★ Simulation of flows of non-Newtonian fluids.

SPECIAL FACILITIES

CONVEX 3820 supercomputer and SGI origin 200 server (4 CPU) for high performance computing; DEC Alpha, SGI Indigo 2, SGI 02 and ultraspare workstations for scientific visualisation; Several front-end workstations; An excellent network comprising of FDDI, Fast Ethernet and Switched Ethernet connecting all the systems; A well established internet connectivity through a 64 kbps radio link to ERNET hub at Software Technology park and backup leased line connection to ERNET hub at Indian Institute of Science.

CONTACT PERSON: Director



National Botanical Research Institute (NBRI)

Rana Pratap Marg, Lucknow 226 001

Telephone: 271031-35, 282879, 282883, 282886

Telegram: BAGH, LUCKNOW

Fax: 282849

E.Mail: manager@nbri.sirnetd.ernet.in

STD Code: 0522

Established: 1953

Director

Dr Palpu Pushpangadan

Grant

1998-99

Rs. 1140 Lacs

Manpower

Scientific & Technical : 105

Total: 600

MANDATE

- To carry out R&D on conservation, improvement and exploitation of economic plants, including ornamentals
- To carry out basic and applied botanical, horticultural and related phytochemical research on plants and plant products
- To develop production technologies for new plant sources of commercial importance

MAJOR R&D PROGRAMMES

- ★ Plant biotechnology, floriculture, tree biology, plant wealth utilisation, environmental sciences, taxonomy and biodiversity
- ★ Basic and applied research in plant molecular biology, biochemistry, and stress physiology
- ★ Standardisation of agrotechniques and package of practices for ornamental plants for nursery and cut flower trade and development of new cultivars

★ Development of production and nursery technology for woody biomass and energy plantation on sub-standard soils

★ Characterization of plant diversity and economic botany of India

SIGNIFICANT ACHIEVEMENTS

- ★ Developed 192 cultivars of 15 well-known ornamental plants
- ★ Development of agrotechnologies for commercial cultivation of gladi-



Low cost high tech protected environment nursery at Biomass Research Centre



Three week old banana plantlets regenerated from clonal propagation of axenic cultures

- **olus spikes and chrysanthemum flowers**
- **Dehydration of fresh flowers and foliage and their employment in floral arts and crafts**
- **Modernisation of betelvine cultivation**
- **Tissue culture protocols for a number of ornamentals, medicinal plants, forest and horticultural trees; efficient protocols for tissue culture based regeneration of chickpea and cotton**
- **Cottage-scale cultivation of six edible mushrooms**
- **High yielding and better adaptable varieties of industrial crops, viz., opium poppy, grain amaranth, Cuphea, safflower, etc.**
- **Botanical authentication of over 100 indigenous herbal drugs and standardisation of 74 Unani compound formulations**
- **Identification of pollution tolerant/resistant plant species, and aquatic plants as bioindicators of heavy metal pollution**
- **Agrotechnology for the cultivation of German Chamomile (*Chamomilla recutita*) on marginal soils; Poplar cultivation in marginal lands; Production of woody biomass on sub-standard soil**
- **Extraction of industrial gum from 'Dhaincha' *Sesbania aculeata* seed**

synthesis about 2000 bp double stranded DNA fragment encoding S-endotoxin protein

- **DNA fingerprinting for neem and amaranthus for biodiversity assessment.**
- **Setting up of databases on economic plants and providing literature search services**

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- **Agrotechnology for gladiolus cultivation in north Indian plains**
- **Floral crafts technology based on dehydrated flowers**
- **Technology for improved cultivation of betelvine**
- **Cultivation of German Chamomile on sub-standard soils**
- **Agrotechnology for high-yielding opium poppy variety**
- **Tissue culture protocol for *Populus deltoides* clones G48 and G5**

FUTURE PROGRAMMES

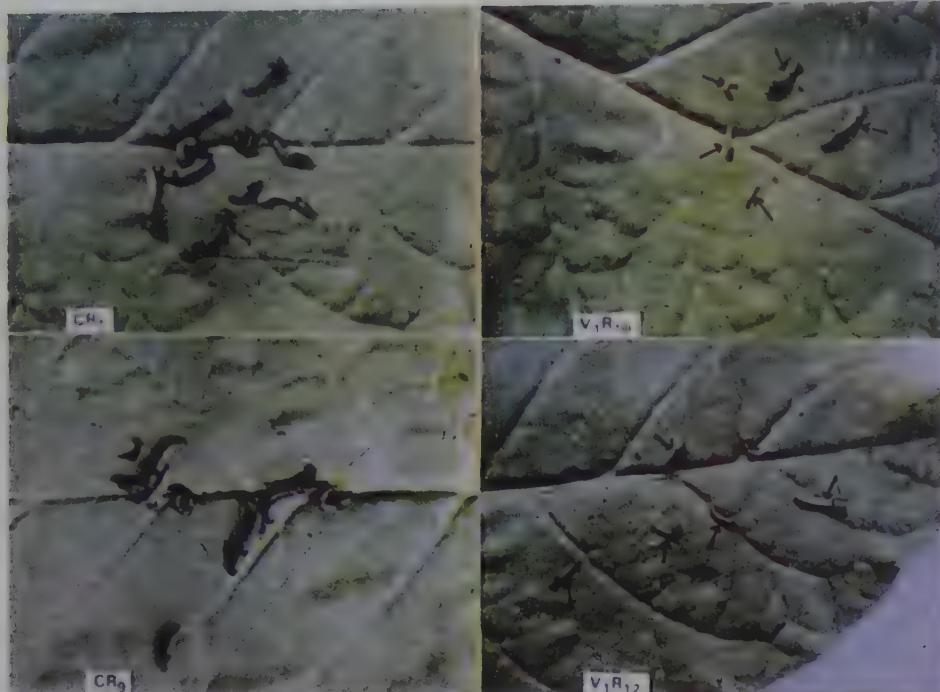
Focus will be on plant molecular biology and biotechnology for developing transgenic plants of tobacco expressing a bacterial gene for toxicity to a variety of polyphagous insects; DNA fingerprinting with other approaches for biodiversity assessment, identification of elite plant varieties, and for establishing taxonomic relationships; development of silvicultural practices for cultivation of high biomass yielding trees as renewable sources of energy on wastelands, agrotechnologies for commercial cultivation of ornamentals; and environmental impact assessment.

SPECIAL FACILITIES

A wide range of modern sophisticated equipments/instruments for carrying out work in photosynthesis, biochemistry, plant molecular biology and plant tissue culture



Mother Teresa

Growth and development of *S. litura* insects fed on control tobacco leaves (A) and transgenic CpTI tobacco plants (B) after 10 day feeding trial

Several testing and evaluation facilities, e.g., Gamma irradiation of plants and plant material, identification of plants, estimation and analysis of plant material for proteins, amino acids, oils, fats/active medicinal principles, gums and mucilages

DNA sequencing centre for nucleotide sequencing
Biomass Research Centre at Banthra
Scanning and Transmission Electron Microscopy
Herbarium
Botanic garden

SERVICES OFFERED

Consultancy in floriculture/garden layout and landscaping/nursery technology with respect to protected environmental nurseries/identification of

and provides several analytical and testing services. The Economic Botany Information Services (EBIS) covers selective dissemination of information (SDI) technical enquiries, bibliography, reprography and current awareness services and a quick access information system for mass media.

TRAINING PROGRAMMES

The Institute conducts short-term training courses in ornamental horticulture and landscaping, commercial cultivation of gladiolus; in the field of general methods of plant tissue culture, floral craft, indigenous herbal formulations, plant molecular biology, environmental studies, field and herbarium methods including curation, taxonomy and ethnobotany, improved cultivation practices of betelvine, wood fuel production in farm forestry and agro-forestry, mutation breeding, etc.

PUBLICATIONS

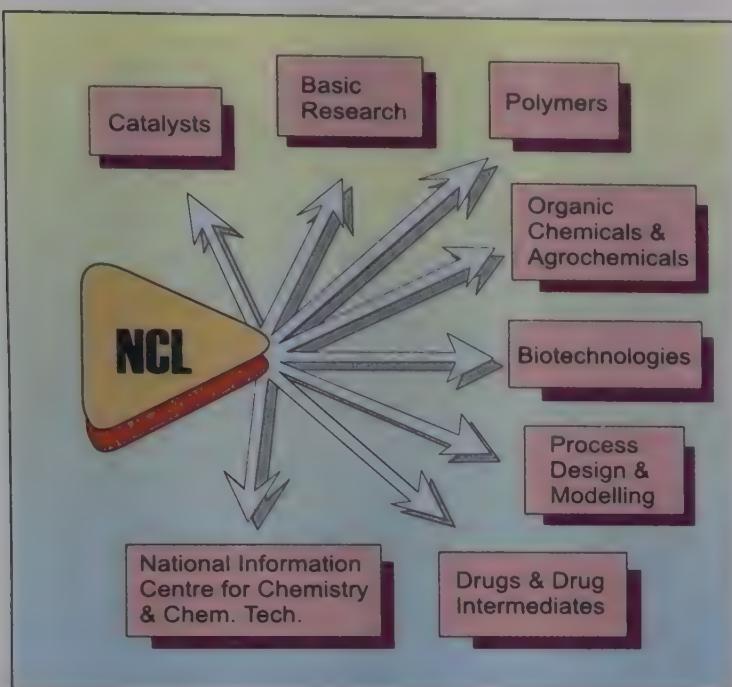
Annual Report, NBRI News Letter (Quarterly) Applied Botany Abstracts (Quarterly), extension bulletins in English and Hindi; bibliographies, manuals, survey reports, reviews and proceedings and publicity folders.

CONTACT PERSON: Director Field Stations

Banthra Research Station and Biomass Research Centre, Kanpur Road, Banthra Distt. Lucknow, U.P.227101 Telephone:0522-297611

NBRI Betelvine Extension Centre, Mahoba Distt., Mahoba, U.P.210 427

plants/environment risk assessment/nucleotide sequencing/tissue culture techniques/Pharmacognostical analysis of herbal drug formulations and in many other areas of expertise. The Institute supplies plant materials of economic value,



National Chemical Laboratory (NCL)

Pune 411 008

Telephone: 336151, 337860, 336451/52/53
 Telegram: CHEMISTRY, PUNE
 Fax: 330233, 3347761, 338212
 E.Mail: prs@ems.ncl.res.in
 rpbd@ems.ncl.res.in
 Website: www.ncl.res.in
 STD Code: 020
 Established: 1950

Director

Dr Paul Ratnasamy

Grant

1998-99

Rs. 2750 Lacs

Manpower

Scientific & Technical: 325

Total: 1020

MANDATE

- To advance knowledge in chemical science and technology
- To develop new processes, products, technologies and applications
- To develop globally competitive technologies and protect intellectual property
- To undertake process design and engineering

MAJOR R&D PROGRAMMES

- ★ Catalysis, biotechnology, organic chemical technology, polymers and other advance materials.

SIGNIFICANT ACHIEVEMENTS

CATALYSIS

- ★ Zeolite catalysts (ZSM-5, Beta, TS-1,2) and solid acid catalysts (supported heteropoly acids and solid super acids);
- ★ Oxidation catalysts based on transition metals (molecular sieves

containing titanium, vanadium, molybdenum, and chromium as well as mixed oxide catalysts like iron - molybdenum, and vanadium-molybdenum);

- ★ Homogeneous catalysts for carbonylation and oxycarbonylation.

- ★ Areas of activity are Petroleum:

- Refining - catalysts for hydrode-waxing and naphtha reforming, FCC additives, etc.
- Petrochemicals - isomerization of xylenes, ethylbenzene, styrene, C6/C9 transalkylation, maleic an-



Catalysts pilot plant

hydride, methyl ethyl ketone, acetic acid and others.

- Fine chemicals - benzofuran, guaiacol, m-phenoxybenzaldehyde, pyridines, hydroquinone/catechol, p-hydroxyanisole, propionic acid, phenyl acetic acid, etc.

★ Clean chemistry - to replace hazardous catalysts like hydrofluoric acid and aluminium chloride. Examples are alkylation, isomerization, etherification, and oligomerization. The other thrust is on oxidation catalysts like TS-1,2; VS-1,2; Sn-MFI, V-NCL-1 and Fe-zeolites. Solid chlorination catalysts for cleaner processes for p-chlorotoluene, p-dichlorobenzene, 4-chloro-o-xylene and chloronaphthalenes also fall in this category.

★ Building up newer routes to feedstocks: for example oligomerization of C3-C4 olefins to get gasoline and jet fuel; oligomerization of n-butenes to C16-C20 olefins leading to high-viscosity oil-base stock, and oxidative coupling of methane to ethane and ethylene as well as oxidative conversion of methane to syngas.

POLYMERS

- New routes to synthesize monomers, modifiers, additives and polymers
- Novel initiators and catalysts for synthesis of polymers with controlled structures
- Polymer blends/compatibilization
- Microencapsulation for controlled release applications
- Environmentally compatible materials
- Speciality polymers
- Fibre reinforced plastics for making two-wheeler components
- Polyurethane-based water-proofing compounds
- High performance polyethylene cable compounds produced by reactive compounding
- Superabsorbing polymers
- Polymer supports for immobilization of enzymes
- Design of novel membrane materials for gas separation through molecular modelling
- Polymers with controlled molecular structure for use as viscosity index improvers
- Novel self-associating polymers for drag reduction

– Intelligent materials based on gel science for application in separation technologies, enzyme mimics, etc.

- Manipulation of polymer surfaces/interfaces for producing materials with improved barrier/adhesive properties
- Water-borne adhesives and surface coatings with enhanced ecofriendliness

ADVANCED MATERIALS

– It has been found that films of amphiphiles can be obtained through self organization without the agency of a condensed solid-phase Langmuir monolayer opens up exciting new possibilities in materials synthesis. Investigations of the structure of LB films, on the one hand, have given new insights and have resulted in deposition of nanoparticles of TiO₂ which can be employed for harvesting solar energy.

ORGANIC CHEMICAL TECHNOLOGY

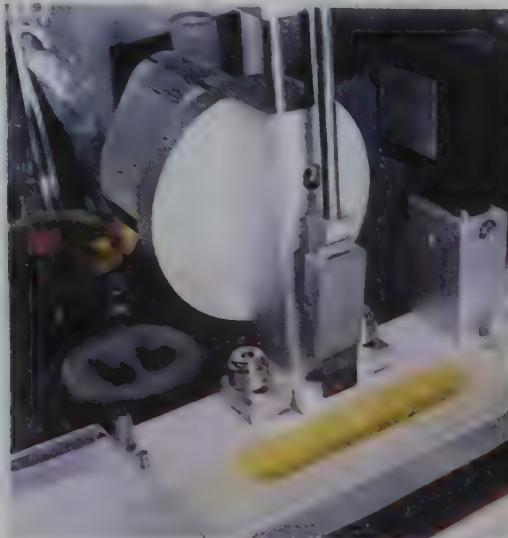
- Complex multistep organic synthesis, synthesis employing homogenous and heterogenous catalysis, bioorganic chemistry, microbial transformations, and



State-of-the-art facilities for testing polymers and polymer products



NCL's polymer products commercialised



Langmuir-Blodgett film on silicon wafer



New automated pilot plant tissue culture facility



A continuous intellectual ferment in chemistry

BIOTECHNOLOGY

- isolation of useful molecules from natural products.
- Complex syntheses of brassinolide, biotin, prostaglandins, vitamin B6
- The five-step process for vitamin B6
- A method of synthesis of the ranitidine intermediate, methylamino methylthio nitroethane, using a zeolite catalyst; and that of methyl N-methyl-carbamate, the key intermediate for carbamate pesticides has been developed.
- Novel fluorescent oligonucleotide probes for replacing hazardous radioactive probes.
- A microbial transformation-based synthesis of phenylglycine.
- The anticancer drugs vinblastine and vincristine from *Catharanthus roseus*; two ecofriendly pesticides from the Indian neem; and morphine and codeine from opium illustrate.
- New vistas: To identify and synthesize new molecules with scientific and commercial potential. Specific targets are taxol, anti-HIV agents, cardiac and antimalarial drugs, plant growth promoters and organic-intermediates for fine and speciality chemicals.

- Plant molecular biology: RFLP and genetic engineering methods are being applied to the breeding of rice and pigeonpea to improve their protein content.
- Plant tissue culture: Development of a disease-resistant and high-yielding variety of sugarcane and elite eucalyptus, bamboo and salvadora forest trees; and isolation

NCL



Global R & D partners



NCL's Albene technology for the production of ethylbenzene

Unique genetic information stored in a DNA molecule can be deciphered in a simple and line form of nucleotide sequence

$$5' \text{--- GTAGGAGTAC ---} 3'$$

$$3' \text{--- ACTGCACTTC ---} 5'$$

$$5' \text{--- GGTTTGCAG ---} 3'$$

$$3' \text{--- TAATTACTCC ---} 5'$$

DNA fingerprinting of Indian elite rice varieties

DNA fingerprinting of Indian elite rice varieties

of superior variants like cardamom, turmeric and ginger. Cardamom variety has boosted commercial production and export of cardamom from India.

BASIC RESEARCH

Innovation on inducing enzyme like activity in stimuli-responsive polymeric gels (Gelzymes) and its

exploration of zeolites with enzyme-like activity (Zeozymes). Groups working on neural networks, parallel processing, fractals, chaos, etc. ensure that this happens.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Xylofining technology for xylene isomerization
- Albene technology for ethylbenzene
- Process for prostaglandins
- Polymer alloys/blends and components
- Encillium technology
- Technology for catalyst for formaldehyde
- Technology for catalyst for conversion of C4 feedstocks to methyl ethyl ketone
- Piperazine and ethylenediamine
- Drug detection kit for narcotics; polymeric support for immobilized enzymes
- Cardamom by plant tissue culture
- Eucalyptus by plant tissue culture
- Vitamin B6

- Theophylline, aminophylline and caffeine
- Process for Beck Bond PU, polyurethane waterproofing coating
- Polyethylene-based cable compound
- Process for manufacture of special grades of PTFE
- Azadirachtin active principle of Neem
- Process for 1-methylamino-1-methylthio-2-nitroethane, an intermediate for antiulcer drugs
- Technology for Alproxolan
- Process for PTFE piston and wear rings for compressors
- Process for vincristine and vinblastine sulphate
- Design package for a 50 TPD monochlorobenzene plant

TECHNOLOGIES READY FOR TRANSFER

- Alprazolam
- Citrate plasticizer
- Catalyst for ethylbenzene from benzene and ethanol and that for formaldehyde from methanol
- 3-Chloro, 4-fluoro aniline

clients. Continuous rejuvenation of skill bases in response to the environment will be a major thrust area.

SPECIAL FACILITIES

- A wide range of modern instruments for characterization and structure determination of chemicals
- A sophisticated catalyst testing unit
- Facilities for fabrication of polymer engineering components
- Gene synthesis facilities
- Pilot plant facilities for catalysts, Polymers, and other chemicals
- National Information Centre for Chemistry and Chemical Technology (NICHEM), electronic on-line/CD-ROM databases

SERVICES OFFERED

- Services offered are in the form of contract research, joint development; consultancy services; technical services; and licensing of technology as listed below:
- Development of new products and processes
- Process design and engineering
- Process improvement and modernization studies
- Product application and market development

agement

- Analytical and other te
services
- Information based service
nology monitoring, asse
and forecasting, multici
ies on emerging techn
new products, etc.

GLOBALIZATION

- NCL files the highest number of patents, both nationally and internationally.
- NCL made the first export of technologies of high tech products from India to the western market.

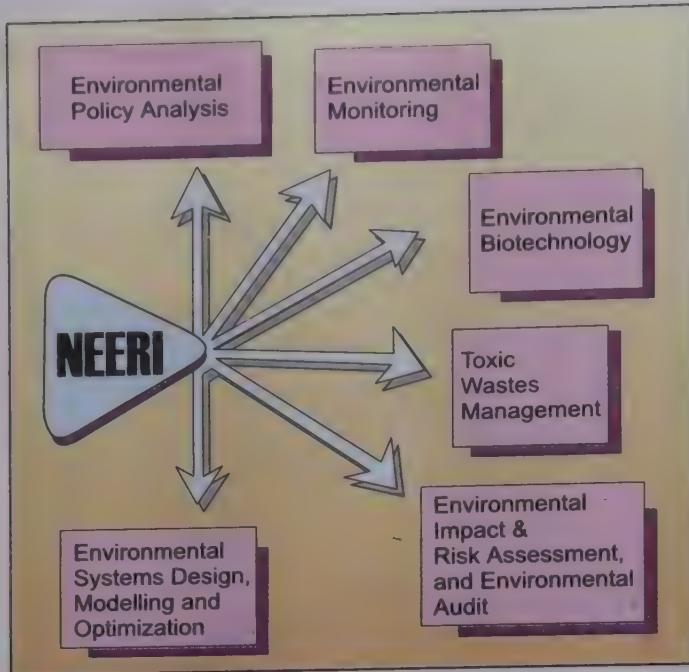
TRAINING PROGRAMM

The laboratory conducts new training programmes for R&D organizations and educational institutions, in its areas of specialization such as plant genetics, plant tissue culture, techniques of chemical membrane science, information and technology management.

PUBLICATIONS

Annual Report NCL In & Around

CONTACT PERSON: D



National Environmental Engineering Research Institute(NEERI)

Nehru Marg, Nagpur 440 020

Telephone: 226071-75
 Telegram: NEERI NAGPUR
 Fax: 222725
 E.Mail: root@csneeri.ren.nic.in
 STD Code: 0712
 Established: 1958

Director
 Dr R.N. Singh

Grant
 1998-99
 Rs. 1180 Lacs

Manpower
 Scientific & Technical: 380
 Total: 515

MANDATE

- To carry out R&D in the domain of environmental monitoring, environmental biotechnology; toxic wastes management; environmental systems design, modelling, and optimization; environmental impact & risk assessment; and environmental policy analysis
- To participate in National Mission programmes, e.g. inspection of environment management systems for the judiciary, Drinking Water Mission, Ganga Action Plan; and in CSIR inter-laboratory thrust area projects, e.g. development of Indian Reference Materials

MAJOR R&D PROGRAMMES

- ★ Environmental Monitoring
- ★ Environmental Biotechnology
- ★ Toxic Waste Management
- ★ Environmental Systems Design, Modelling and Optimization
- ★ Environmental Impact & Risk Assessment; and
- ★ Environmental Policy Analysis

SIGNIFICANT ACHIEVEMENTS

- ★ Installation of defluoridation plants in Andhra Pradesh for Rajiv Gandhi National Drinking Water Mission.
- ★ Water quality monitoring of Ganga and performance evaluation of sewage treatment plants
- ★ Audit of air monitoring stations in South East Asia Region



OSCR Reception antenna at Hazira

Red cells of genetically engineered *Pseudomonas putida* expressing cytochrome P450 Cam

Plate on left shows *E.coli* 0157:H7 bacterial cells without phage infection. Plate on right shows *E.coli* 0157:H7 bacterial cells infected with transducing phage giving fluorescence upon exposure to UV light

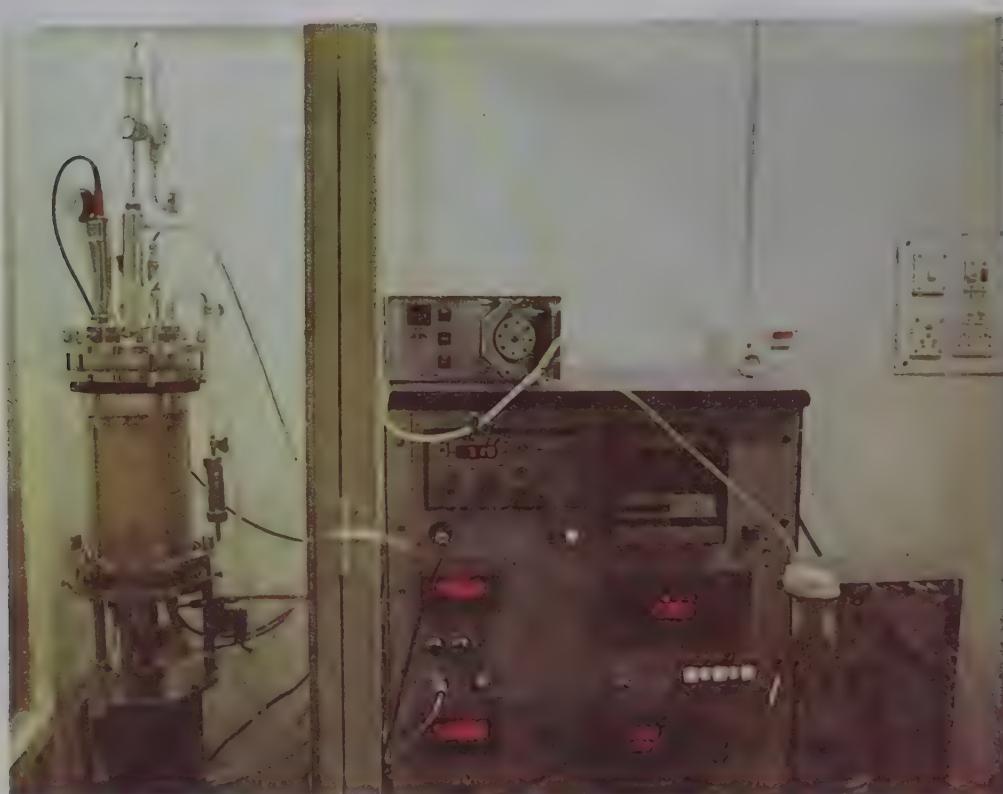
- Surveillance of Aerobipollutants in Nagpur
- Monitoring of trihalomethans, pesticides, heavy metals and nitrogenous and phosphatic materials in Mumbai Water supply.
- Development of Duplex Reverse Transcription PCR (RT-PCR) for simultaneous detection of Hepatitis A and E Viruses isolated from Drinking Water Samples
- Application of Bacteriophage based rapid detection of *Escherichia coli* 0157:H7 in water and food.

cherichia coli 0157:H7 in water and food.

- Chemo-biochemical system for desulphurization of sulphur recovery unit (SRU) tail gas at Mathura Refinery
- Construction of genetically engineered strains for microbial desulphurization of petroleum crude
- Development of molecular biology approaches for bioremediation of contaminated sites
- Application of molecular genetics for management of Nitro-aromatics in waste waters.
- Biodegradation of Chloroaliphatics and Chloromatics in sequential anaerobic-aerobic systems
- Environmental assessment of hazardous waste treatment and disposal facility at Dabhil (Maharashtra)
- Application of chromosomal aberration technique for rapid genotoxic risk assessment of hazardous wastes



Multiplex PCR amplification of enteropathogens in Ganga water at Haridwar and Rishikesh

Continuous cultivation of *Pseudomonas* sp SF1 on p-nitrophenol

- ❖ Development of indigenous vehicular emission control technologies
- ❖ Development of flyash based Zeolites and delineation of their applications
- ❖ Development of fixed film-fixed bed reactor technology for high rate biomethanation of wastewaters
- ❖ Wastewater management in clusters of tanneries in Tamil Nadu

- ❖ Basic engineering for Common effluent treatment plants (CETP) in twentyeight industrial estates in NCT-Delhi
- ❖ Design and installation of Common Effluent Treatment plants (CETP) at Pali and Balotra
- ❖ Removal of Arsenic from Groundwater in West Bengal
- ❖ Design and installation of High Rate Transpiration Systems (HRT) for treatment and utilization of wastewater at Puri
- ❖ Reclamation and revegetation of mine spoil and flyash dumps through Integrated biotechnological approach
- ❖ Development of tissue culture of sandalwood, *Santalum album* L.
- ❖ Carrying Capacity based Developmental Planning for Greater Kochi Region
- ❖ Examination of Sustainability and Environmental viability of select projects, viz.
- ❖ Goshree integrated island development plan, Kochi; Coal based thermal power plant of Mangalore power company (with Cogentrix lead partner) at Nandikur, Karnataka; Sanghi Jetty/Cement Project, Kutch, Gujarat
- ❖ Monitoring of Ambient Air Quality in ten major Indian cities, viz. Ahmedabad, Calcutta, Chennai, Delhi, Hyderabad, Jaipur, Kanpur, Kochi, Mumbai and Nagpur.
- ❖ Over 100 reports prepared on environment management systems in various states of the country for High Courts in Andhra Pradesh, Gujarat, Himachal Pradesh and Madhya Pradesh.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ❖ Catalytic Converter and Particulate trap for automobile exhaust emission control



Facility for production of catalytic converters



Pilot plant facility for the production of flyash based zeolites



Fixed film reactors based biomethanation plant

- ★ Fixed film-fixed bed reactor technology for biomethanation of wastewater
- ★ High Rate Transpiration System for treatment & utilization of wastewater

- ★ Common effluent treatment plants, Pali, Balotra in Rajasthan
- ★ Screw jet aerator
- ★ Microprocessor-controlled sequential air sampler
- ★ Respirable dust sampler

TECHNOLOGIES READY FOR TRANSFER

- ★ Low-cost, Non-noble metal based catalytic converter for Auto-exhaust emission control
- ★ Diesel particulate filter
- ★ Flyash based zeolites
- ★ Biotechnological conversion of lignocellulosic substrates to cellulase, liquid glucose, and value-added chemicals
- ★ Biotechnological production of biosurfactants
- ★ Production of biodegradable plastics from industrial wastewaters
- ★ Biobenefication of coal containing high pyritic sulphur and ash
- ★ Desulphurization of gaseous fuels and emissions
- ★ Biotechnological recovery of hydrocarbons from oily sludges
- ★ Oil spill remediation and treatment of petroleum refinery wastewaters



Casurina grown in high rate transpiration system at Puri

Growth and development of multiple shoots of *Santalum album* L.

- ★ Bioremediation of mine spoil dumps
- ★ Fixed-film reactor technology for biomethanation of wastewater
- ★ Recovery of biogas from landfills
- ★ Molten salt combustion technology for destruction of hazardous industrial wastes
- ★ Low-cost water treatment systems for small communities
- ★ Common effluent treatment plants
- ★ Resource recovery-based low-cost wastewater treatment systems
- ★ Noncellulosic membranes for ultrafiltration systems
- ★ Reclamation of mine spoil dumps
- ★ Portable instruments for monitoring of pH, DO, temperature and conductivity
- ★ Microprocessor-based low-cost monostatic sodar
- ★ Electronically controlled automatic sequential air sampler
- ★ Defluoridation of water (hand pump attachable, fill & draw, and continuous flow types)
- ★ Chlorine tablets and ampoules

SPECIAL FACILITIES

Fourier Transform Infrared Spectrophotometer
 UV-VIS-NIR Spectrophotometer
 Inductively Coupled Plasma Atomic Emission Spectrometer (ICP-AES)
 High Performance Liquid chromatograph
 Ocean Surface current radar (OSCR)
 Advanced computer work stations with necessary software for activities related to Geographic Information System (GIS), Digital Image Processing (DIP), and Knowledge Based System (KBS)

SERVICES OFFERED

Consultancy services on Water and Wastewater Engineering, Air pollution Control, toxic waste management; Environment systems design, modelling and optimization; Environmental Impact and Risk Assessment; Environmental audit; Life Cycle Assessment, Natural Resource Accounting and Environmental Policy Analysis.

TRAINING PROGRAMMES

The Institute conducts training courses in the areas of Air pollution

monitoring and control, water pollution, preventive maintenance of water distribution system, analytical quality control, environmental biotechnology, solid waste management, environmental impact and risk assessment and environmental audit.

PUBLICATIONS

Annual Report. The Institute brings out Indian Journal of Environmental Health, Paryavaran Patrika (Hindi).

CONTACT PERSON: Director
Zonal Laboratories

Ahmedabad

Zonal Laboratory
 Suburban Sub-pumping Station
 Beyond Calico Mills
 Sewage Farm Road
 Ahmedabad 380022
 Tel: 5320419(Off)
 6752181(Res)
 Gram:NEERI, Ahmedabad
 Fax:079-5320419

Calcutta

Zonal Laboratory
 I-8, Sector 'C'
 East Calcutta Area Development Project

P.O. Haltu,
Calcutta 700078
Tel:4421988(Off)
4777649(Res)
Fax:033-4421988
Gram: NEERI Calcutta

Chennai

Zonal Laboratory
CSIR Complex, TTTI Taramani P.O
Chennai 600113
Tel:2351964(Off)
417031(Res)
Telex:041-21067 CSIR IN
Gram:CONSEARCH, Chennai
Fax: 044-2351964

Delhi

Zonal Laboratory
Chandrawal Water Works No.II,
Lala Shannath Marg
Delhi 110054
Tel:2514131,2522866(Off)
6421843(Res)
Fax:011-2514131
Gram: NEERI Delhi

Hyderabad

Zonal Laboratory
IICT Campus, Uppal Road
Hyderabad 500007 (A.P.)
Tel:7173539(Off)
7602836(Res)
Telex:0425-7061 IICT IN
Gram:IICT IN, NEERI Hyderabad
Fax:040-7173539

Jaipur

Zonal Laboratory
CFC-1, Malviya Industrial Area
Jaipur 302017
Tel:525469 (Off)
550730 (Res)
Telex:0365-2549
Gram:NEERI, Jaipur
Fax:0141-525482
E.Mail:root@csneerij ren.nic.in
sps@csneerij ren.nic.in

Kanpur

Zonal Laboratory
6/33 Civil Lines
Near Bhaironghat Pumping Station
Kanpur 208002(U.P.)

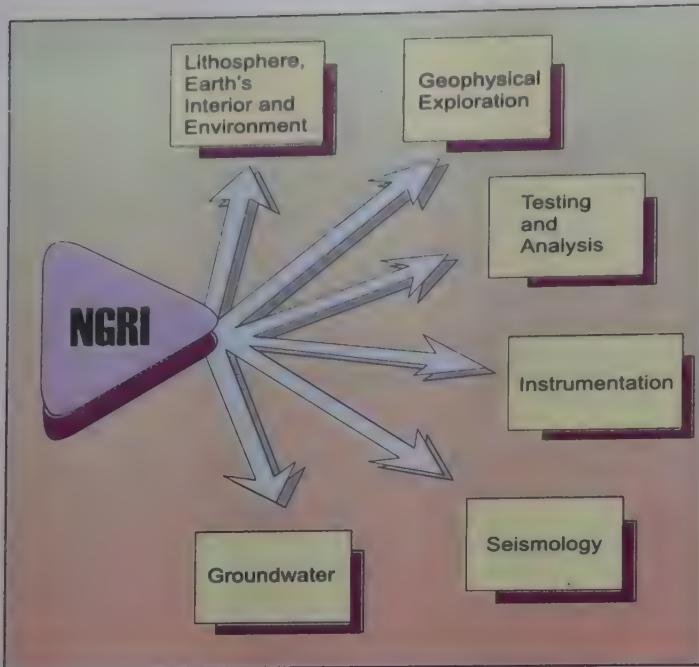
Tel:540127(Off)
251670(Res)
Gram:NEERI, Kanpur
Fax:0512-540127

Kochi

Zonal Laboratory
CSIR Kochi Campus
Kalamassery(South)
Ernakulam
Kochi 683109(Kerala)
Tel:541789(Off)
0481-582134(Res)
Gram:NEERI, Ernakulam
Fax:0484-542513

Mumbai

Zonal Laboratory
89/B, Dr. Annie Besant Road
Worli, Mumbai 400018
(Maharashtra)
Tel:4974607(Off)
4973521(Guest House)
4966929(Res)
Telex:011-75462 NERI IN
Gram:BOMPHERI, Bombay
Fax:022-4936635



National Geophysical Research Institute (NGRI)

Uppal Road, Hyderabad 500 007

Telephone: 7171124
 Telegram: GEOPHYSICS
 Fax: 7170491/7171564
 E.Mail: harsh@csngri.ernet.nic.in
 Website: <http://www.ngri.com>
 STD Code: 040
 Established: 1961

Director

Dr Harsh K. Gupta

Grant

1998-99

Rs. 1960 Lacs

Manpower

Scientific & Technical: 195

Total: 860

MANDATE

- To carry out basic and applied research in the frontier areas of solid earth geophysics
- To obtain information about the earth's interior by seismic, magnetotelluric, electrical, magnetic, thermal and gravitational methods
- To study the history of the lithospheric and crustal evolution in space and time through integrated geological, geochemical, geophysical and geochronological studies
- To devise new geophysical methods, techniques and instruments for the exploration of minerals and ground water resources
- To study the processes involved in earthquakes and related phenomena

MAJOR R&D PROGRAMMES

- ★ Exploration of hydrocarbons and coal
- ★ Mineral exploration and engineering geophysics
- ★ Exploration, assessment and management of ground water resources

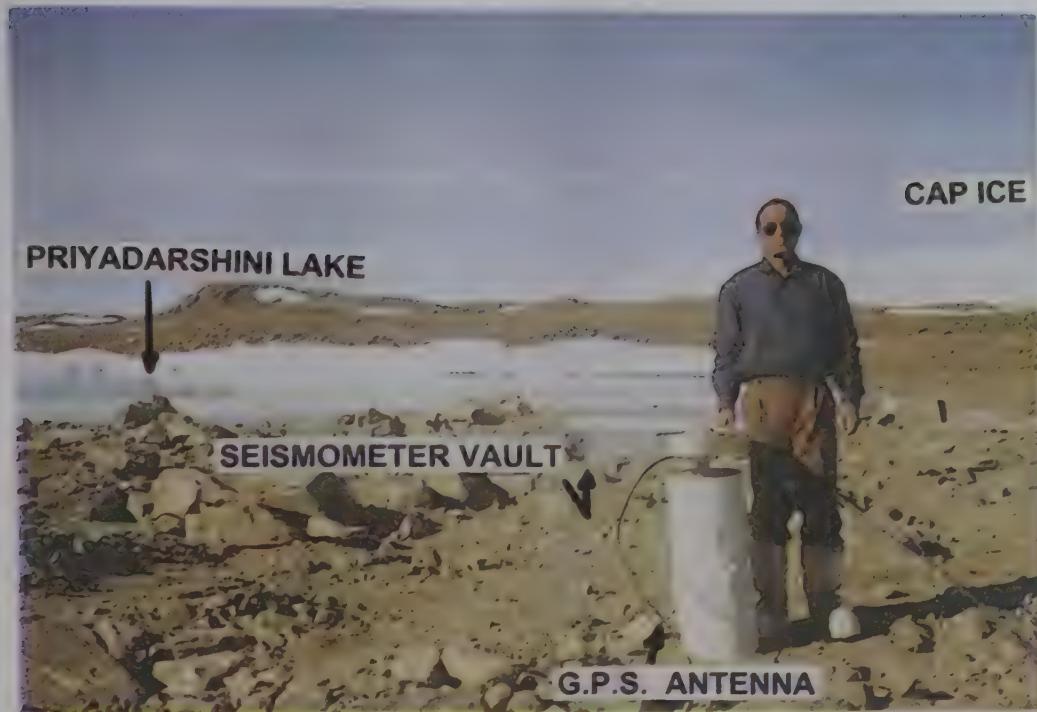
★ Earthquake hazard assessment

★ Lithosphere, earth's interior and palaeo-environment

★ Geophysical instrumentation

SIGNIFICANT ACHIEVEMENTS

- ★ Integrated geophysical surveys for possible location of hydrocar-



Underground Seismometer vault of the permanent digital seismological station and global position system antenna at Maitri, Antarctica. The Priyadarshini lake is seen in the background. In the deep background is the cap ice.



Portable multiprobe borehole logger

bon occurrences in Mesozoic sediments below the basaltic lava flows of Saurashtra region

★ Geochemical exploration for discovering economically exploitable gold deposits in the Banded Iron formations of Karnataka

● Preliminary identification of gas hydrate bearing zones in the Indian off-shore regions

● Modelling of 2D and 3D seismic structures of the crust and sub-crustal lithosphere using refraction/ reflection profiling,

tomographic and gravity techniques

- Studies on the dynamics of the solid earth
- Establishing facilities for airborne geophysical survey
- Deep drilling studies in the co-seismic rupture zone in the Killari (Latur) earthquake region
- Seismotectonic studies for earthquake hazard assessment
- Refinement of the gravity methodology through new techniques
- Evaluation of *in-situ* stress field in the NE Indian shield through fracturing techniques
- Preparation of morphological zoning map of the Indian subcontinent
- Geoscientific investigations including aeromagnetic surveys and establishment of permanent seismological observatory and GPS station in Antarctica
- Establishing of GPS tracking system at NGRI

MAJOR SPONSORED SURVEYS

Integrated geophysical studies in Saurashtra for detection of Mesozoic sediments hidden underneath the Deccan trap

Integrated geophysical studies in South Indian granulitic terrain to evaluate crustal thickness and its tectonic development

Ground water exploration and management studies in hard rock Precambrian terrains

Studies for seismic surveillance in north eastern India, the south Indian shield and reservoir induced seismicity

Studies for delineation of suitable corridor in the Arabian sea for laying the proposed Iran-India gas pipe line
Developed knowhow for geophysical instruments for possible commercial production

TECHNOLOGIES READY FOR TRANSFER

- ★ Portable multiprobe borehole logger
- ★ Salinity testing device
- ★ Transient EM Unit
- ★ Data storage magnetometer

FUTURE PROGRAMMES

- Exploration and exploitation of Gas hydrates
- Helicopter borne surveys for detecting kimberlite pipes
- Multiparametric geophysical imaging of deep continent in the south Indian shield and western Himalayan region
- Study of the ground motion acceleration for designing earthquake resistant structure
- Global positioning studies for crustal deformation of Indian plate

SPECIAL FACILITIES

- Laboratory facilities for geochemical, geological and geochronological

studies; (X-ray fluorescence spectrometer, Atomic absorption spectrometer, Electron probe Microanalyser, Plasma source mass spectrometer, UV-Vis Spectrophotometer, Thermal ionization mass spectrometer, Lead isotope laboratory, X-ray spectrometer, Helium sniffer, etc.)

Stable isotopes, radiocarbon and tritium, tracer, palaeomagnetic, high temperature/pressure and mineral physics laboratories

Seismological, magnetic and electrical pulsation observatories at Hyderabad and Ettaiyapuram to monitor seismicity and magnetic activity respectively

Capability to carry out field investigations using seismic, magnetotelluric, gravity and deep resistivity studies with the latest available equipment

Mobile observatories for dam sites investigations

SERVICES OFFERED

Surveys for hydrocarbon, mineral and groundwater exploration, foundation engineering, mining engineering, reservoir induced seismicity and environmental hazard studies.

Provides analytical and testing facilities for rocks, ore, mineral and water samples.

TRAINING PROGRAMME

Courses for students and inservice personnel in mineral, ground water exploration methods and other related activities of the Institute.

PUBLICATIONS

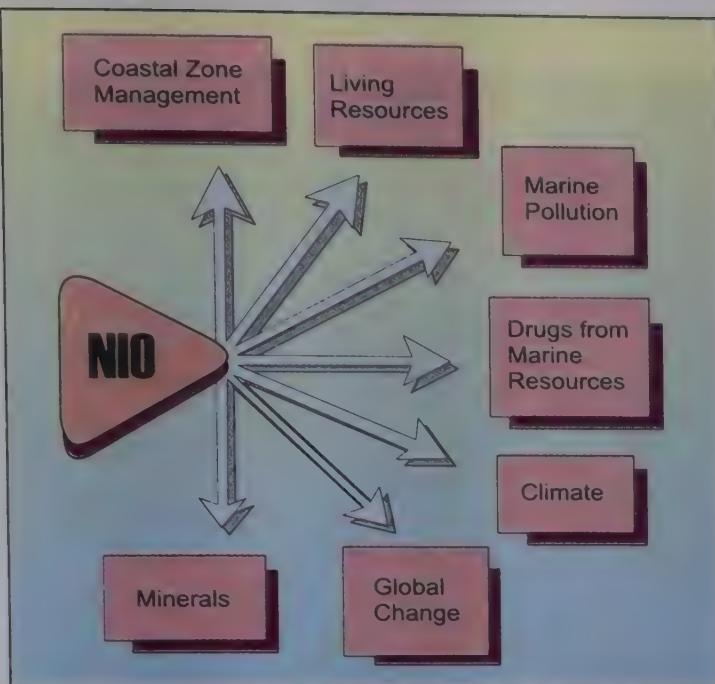
Annual Report, Technical Reports(irregular)

CONTACT PERSON: Director

Field Stations (Observatories)

Equatorial magnetic and micropulsation observatory, Ettaiyapuram, Tamilnadu

Network Seismic stations in NE Region



National Institute of Oceanography (NIO)

Dona Paula, Goa 403 004

EPABX:226253,221322

Grams: OCEANOLOGY, PANAJI

Fax: 223340,229102

E.Mail: ocean@darya.nio.org

ocean@csnio.ren.nic.in

URL: <http://www.nio.org>

STD Code: 0832

Established: 1966

Director
Dr Ehrlich Desa

Grant
1998-99
Rs. 1600 Lacs

Manpower
Scientific & Technical : 210
Total: 620

MANDATE

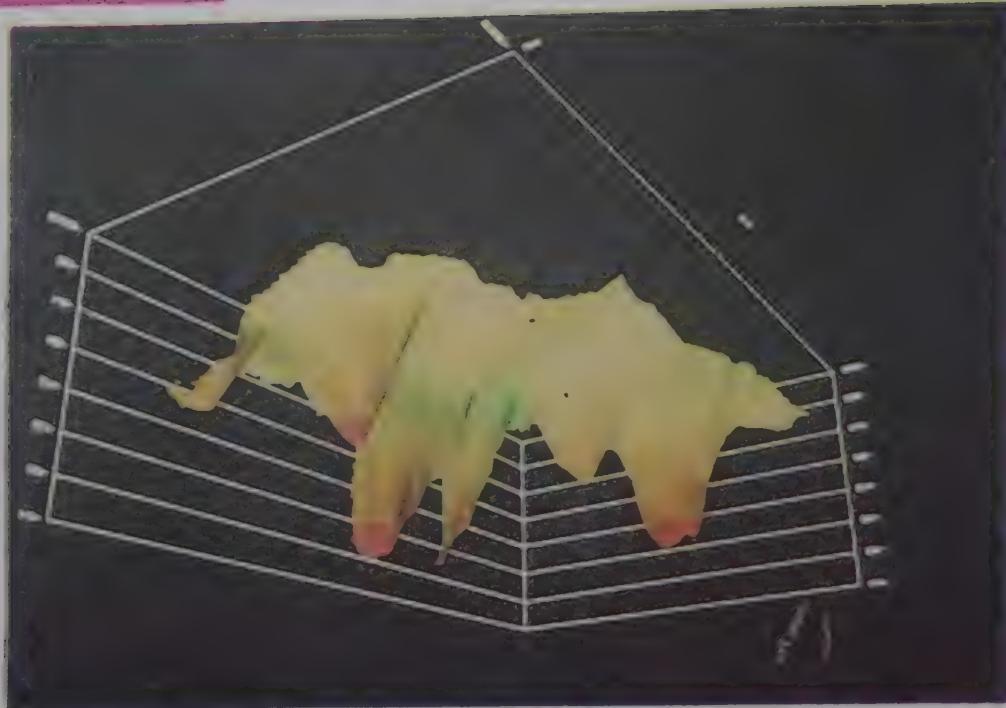
- To develop a knowledge-base relating to physical, chemical, biological, geological, geophysical, engineering and pollution aspects of the seas around India
- To build up competence for judicious use of the sea resources for the benefit of the country
- To develop self-sufficiency in marine instrumentation
- To extend co-operation to all R&D organizations and academic institutions involved in the study of marine sciences and cater to information needs of the user community
- To foster national and international co-operation in various fields of oceanography in order to facilitate the exploration and proper use of the sea

MAJOR R&D PROGRAMMES

- ★ Coastal Environment
- ★ Ocean Engineering & Technology
- ★ Ocean Processes
- ★ Offshore Resources

SIGNIFICANT ACHIEVEMENTS

- ★ Survey of polymetallic nodules in an area of about 4 million sq. km in the Central Indian Ocean. This work resulted in registration of India as the first 'Pioneer Investor'



An active spreading centre and submarine volcanoes in the Andaman Backarc Basin

country in the world under UN and getting allocation of an area of 1,50,000 sq.km for developing a mining site.

★ Survey of the shallow offshore areas of Konkan coast has indicated about 12.5 million tonnes deposite of ilmenite. Also, bathymetric, sedimentological, geochemical, geomorphological and magnetic anomaly maps for major portion of the Indian continental shelf have been prepared.

★ A few models covering land-sea and air-sea interactions and ocean dynamics have been developed to understand variability of monsoon. Sea level rise due to Green-house effect have revealed that Lakshadweep Archipelago is most vulnerable to inundation.

★ Satellite altimetry of the Bay of Bengal has indicated the presence of anticyclonic gyres in the Bay interior while hydrographic investigations indicated the presence of a cyclonic eddy in the upper 200m.

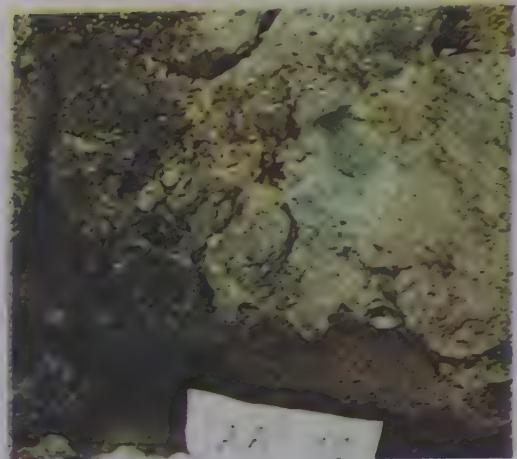
★ A 3-D semi-diagnostic model of circulation developed to compute

the steady state circulation, sea surface topography and adopted temperature and salinity fields in the tropical Indian Ocean north of 20°S latitude and upto 80°E longitude, reproduced realistic sea surface topography and associated circulation patterns.

★ The physical, chemical, biological, geological and geophysical studies of the Exclusive Economic Zone (EEZ) of India and other areas in the Indian Ocean have led to understanding of the ocean processes and of previously undiscovered resources.

★ Studies of siltation on the sedimentation in the harbours and adjacent areas have been completed.

★ Equipments for scanning the ocean interior and numerical acoustic models have been developed and soundspeed structure reconstructed. The acoustic field from Antarctic to the Central Arabian Sea at 74°E has been prepared. A methodology for operation of an ocean acoustic tomographic system has also been developed.



Rock sample with features resembling hydrothermal vents collected from the Andaman Sea

★ Carried out survey of marine living resources New culture techniques for green mussels on ropes from floating rafts. Culture technique for commercially important marine organisms like fin fish in floating cages have been developed.

★ A method for the preparation of *Tachypleus* Amoebocyte Lysate(TAL), a testing agent for microbial endotoxins, from the blood of horse-shoe crab *Tachypleus gigas* without sacrificing the animal has been developed. TAL is used in drugs, pharmaceutical and food industry.

★ A promising substitute for antifouling chemicals has been isolated from a marine sponge. The compound is non-toxic at sub-lethal concentration levels and a patent on the isolation process of the compound has been filed.

★ More than 500 species of marine flora and fauna have been studied for antiviral, antifungal and CNS depressant activities. A new toxic sapogenin has been isolated from sea cucumber. Extract from sample, (NIO-497) (a mangrove species), showed antibacterial activity against 8 strains of Gram+v and -ve bacteria. The major active principle isolated was a flavonoid. Extract from sample, (NIO-450) (also a mangrove species) pro-



ORV Sagar Kanya

duced two pure compounds, flavonoid and triterpene glycoside, both identified as promising axiolytic. Sample NIO-450 also exhibited good antidiabetic properties.

★ A chemical model of the Arabian Sea has been developed using thermodynamic data of the major and minor components of sea water. Regular monitoring of the Indian seas with regard to pollution by heavy metals, pesticides, hydrocarbons, etc. has helped assess the health of our seas.

★ Three seamount chains, one multi-peaked with distinct craters in the Central Indian Ocean Basin, the second 2.5 km high in the eastern Arabian Sea the third at about 455 km west-southwest of Bombay have been identified.

★ High resolution shallow seismic reflection data from the continental shelf sediments off western India revealed methane rich horizons. Potential sub-surface methane estimates in this gas charged area are of the order of 2.6 Tg.

★ Evidences of recent volcano-hydrothermal activity were recorded in the Central Indian Ocean Basin(CIOB) which was previously considered inactive.

★ Geophysical studies in the Andaman Seas revealed the delineation of active ridge segment along the Backarc Ridge, with indications of hydrothermal activity. It was further revealed that the Backarc Basin has a complex morphotectonic structure with exciting promise for future surveys.

★ Organized the First Indian Scientific Expedition to Antarctica and participated actively in the subsequent expeditions.

★ To develop remote sensing techniques for ocean studies an Ocean Remote Sensing Centre has been set up. Various ocean features have been studied and mapping of mangrove vegetation and geomorphological studies have been carried out.

★ Technical know-how for several marine instruments like electronic bathythermograph, wind recorder, automatic weather station and di-

rect reading current meter released to NRDC. A self-recording and transmitting tide gauge has also been developed. The instruments developed are moored data buoys, drifting buoys and inwater spectral radiometer. Three PVC stilling-wells for air-acoustic tide gauges were fabricated and installed at Goa, Madras and Port Blair, as a successful pilot project in indigenous fabrication for the imported gauges.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Technique for green mussels culture on ropes using wooden rafts
- ★ Use of horse-shoe crab blood without sacrificing the animal, for preparation of TAL
- ★ Microbial culture for biopulping, biobleaching and effluent treatment in paper industry
- ★ Making of liquid fertiliser from seaweeds
- ★ Electronic tide gauge, electronic bathythermograph, wind recorder, automatic weather station and direct reading current meter

SPECIAL FACILITIES

- ★ Research vessel Sagar Kanya, well equipped for round the year Oceanographic research. It has facility of mapping the seabottom and providing the real time graphic display and bathymetric chart
- ★ National Oceanographic Data Centre for the Indian Ocean (RNODC-INDO) for acquiring, processing and disseminating oceanographic data.
- ★ Processing of satellite imageries
- ★ Central computing facility
- ★ Marine Biotechnology Information Centre with a database on marine life of India

- A Local Area Network which is interconnected to 100 PC nodes
- An Integrated Data Acquisition System (IDAS) developed and installed onboard FORV Sagar Sampada.

SERVICES OFFERED

Coastal zone development, Submarine pipeline, Seabed surveys and marine outfalls, environmental impact assessment and ocean engineering, pollution control and waste disposal in the sea, port and harbour development, design and development of marine instruments, resource surveys, marine biotechnology, marine archaeology and other problems connected with the sea.

Library services including ASFA CD-ROM computer literature search, services for dissemination of oceanographic data, multiuser search facilities on UNIX platform for information on marine biotechnology and marine

science and technology information services.

TRAINING PROGRAMME

Short-term training courses in marine sciences for government agencies, R&D organisations and educational institutions both in India and abroad.

The Institute provides training in exploration of the sea resources, shipboard training in the collection and processing of oceanographic data and facilities and divers for underwater exploration.

PUBLICATIONS

Annual Report, Monthly Newsletter, Technical Reports, Cruise Reports and Information Brochures. Wave Atlas for the Arabian Sea and Bay of Bengal. Oceanographic Atlas of the Exclusive Economic Zone(EEZ) of India and data inventories.

CONTACT PERSON: Director

Regional Centres

NIO Regional Centre
P.B.No.1913

Vidyaniketan Annex Building
Providence Road, Ernakulam
Kochi-682018

Phones:(091)484-390306,390814
Grams: OCEANOLOGY, ERNAKULAM
Telex: 0885-6399 NIO IN
Fax: 0484-390618
E.Mail: kkcnair@csnioc ren.nic.in

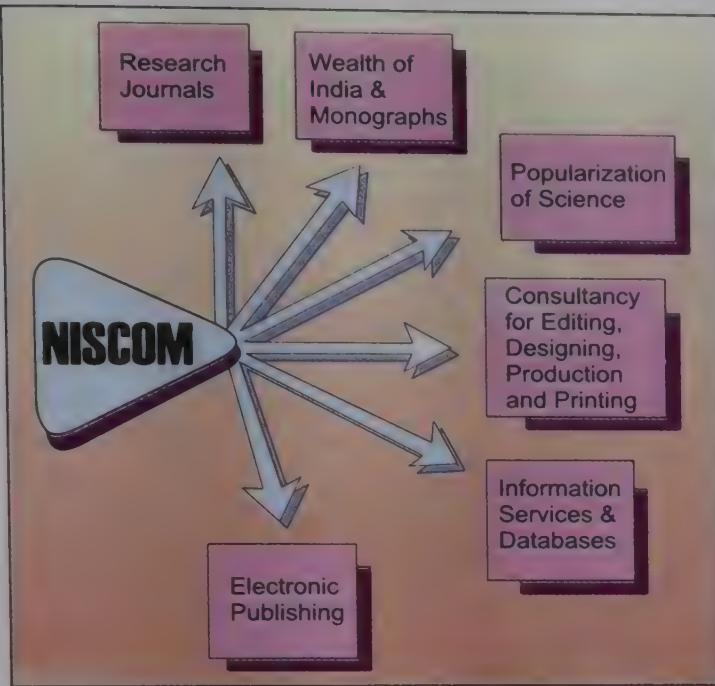
NIO Regional Centre

Sea Shell Building
Seven Bungalow
Versova, Mumbai-400061

Phones: (091)22-6363773,6326419
Grams: OCEANOLOGY, MUMBAI
Telex: 011-78419 NIOB IN
Fax: 022-6326426
E.Mail: mahesh@csniob ren.nic.in

NIO Regional Centre

176, Lawson's Bay Colony
Visakhapatnam-530017(A.P)
Phone: (091)891-539180
Grams: OSTECHLAB, VISAKHAPATNAM
Fax: 0891-543595
E.Mail: ksr@kadali nio.org
sicrcv@kadali nio.org



National Institute of Science Communication (NISCOM)

Dr K.S. Krishnan Marg,
New Delhi 110 012

Telephone: 5786301, 5746024
Telegram: PUBLIFORM NEW
DELHI
Fax: 5787062
E-Mail: niscom@sirnetd.ernet.in
STD Code: 011
Established: 1951

Director-in-Charge
Prof. Rajesh K. Kochhar

Grant
1998-99

Rs.720 Lacs

Manpower
Scientific & Technical: 85
Total: 345

MANDATE

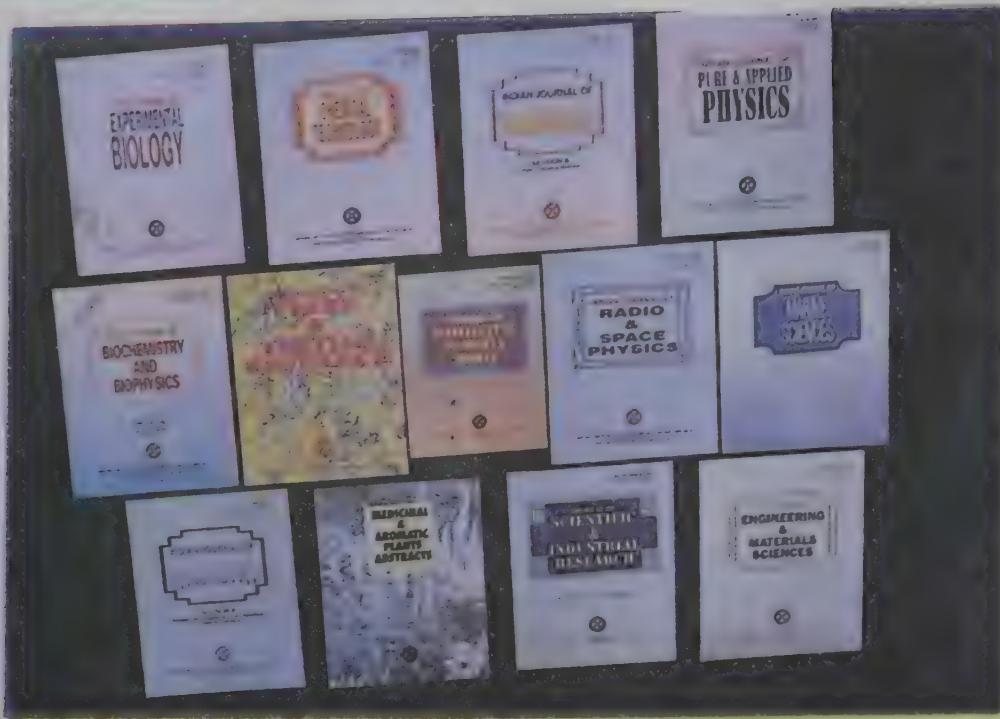
- To provide formal linkages of communication among the scientific community in the form of research periodicals in different areas of science and technology
- To collect, collate and disseminate information on plant and mineral wealth and on industrial infrastructure of the country
- To set up of specialized databases and providing information services to entrepreneurs, policy planners, agriculturists and research workers
- To disseminate of S&T information to the masses

MAJOR PROGRAMMES

- ★ **Research Journals:** NISCOM publishes a family of 13 research journals in various disciplines of science and technology. They are covered by most of the important abstracting and current awareness services.
- ★ **Wealth of India:** The Institute brings out encyclopedic publica-

tions on Indian raw materials and monographs on specific topics. These publications serve as informative and reliable sources of reference for researchers, policy makers, industrial entrepreneurs, agriculturists and students. The Institute has set up a Research and Specimen Cell which acts as a repository of economic raw materials.

NISCOM



Scholarly research journals



Some of the popular science books and periodicals

Information Services: The Institute has an information service on medicinal and aromatic plants called Medicinal & Aromatic Plants Information Service (MAPIS) and brings out an abstracting journal on medicinal and aromatic plants (MAPA). NISCOM is a national node of the Asian and Pacific Information Network on Medicinal & Aromatic Plants (APINMAP), with

the objective of which is to promote exchange of information and resources among the 14 member countries.

Electronic Publishing: NISCOM has entered the field of electronic publishing and is currently managing the production and marketing of a series of CD-ROMs (Compact Disk-Read Only Memory) for a

consortium of nine Asian organizations, Asian Health, Environmental & Allied Databases (AHEAD). In this CD-ROM series, two disks entitled "Environment & Health Asia" and "Wealth Asia" are being published. NISCOM has contributed its Wealth of India and MAPA databases to the "Wealth Asia" disk of the AHEAD CD-ROM series. The two disks are updated every six months.

- Science Popularization: The science popularization programme of the Institute includes publication of popular science journals, monographs and books and publication of S&T encyclopedias.
- The Institute also publishes CSIR newsletters, status reports on S&T etc.

SIGNIFICANT ACHIEVEMENTS

Primary Information: The Institute has brought out special issues of the research journals on topics of contemporary relevance. The issues brought out during the last couple of years include those on condensed matter physics, recent advances in technical textiles, Paryavaran III, and satellite oceanography and modelling. Three biological journals (IJBEP, IJBBP and IJMS) of the Institute have been put on internet (Bioline). Chinese edition of two chemistry journals are coming out since 1996.

The Wealth of India - Raw Materials series which is under revision has already brought out three volumes of the revised series. A number of monographs on specific and composite topics have also been brought out. The important among these are Plants for Reclamation of Wastelands, Birds, Citrus Fruits in India, Tea in India and Groundnut in India.



A view of the printing unit under operation

- ★ MAPIS database has been computerized and is available on-line to users.
- ★ Science Popularization programme: Fifty-five books on scientific topics of general interest have been brought out in English with their translation versions in other Indian languages. A scientific encyclopedia, for children Golden Treasury of Science & Technology, has been also brought out.
- ★ Department of Ocean Development (DOD) sponsored project "Dissemination of Oceanographic Information" under the sponsored programme by the Department of Ocean Development (DOD) books in English, Hindi, Tamil and Telugu have been brought out.

- ★ Dissemination of Biotechnological Information: Ten books/monographs on biotechnological topics have been brought out under the sponsorship of Department of Biotechnology.
- ★ NISCOM has been selected as the managing organization for an IDRC (Canada) sponsored international consortium formed for the production and global marketing of a series of CD-ROM disks. NISCOM has acquired expertise in this futuristic technology and three disks have been already been produced.

FUTURE PROGRAMMES

Plans are afoot to strengthen the industrial information service by building databases in the following areas: agro-industries, environmental risk

analysis and pollution control, energy (non-conventional sources), waste utilization, food-processing industries and biotechnology.

NISCOM will consolidate its activities in the field of electronic publishing.

SPECIAL FACILITIES

Photo type-setting and DTP
Offset printing
Production, Art and Graphics
Computerised databases
Recorder; CD-ROM drives
Herbarium

SERVICES OFFERED

Information services on medicinal & aromatic plants, Consultancy for editing, designing and printing of S&T documents, brochures, books, journals, etc.

Electronic publishing in the CD-ROM form
Database building
Plant and crude drug identification
Training in science communication

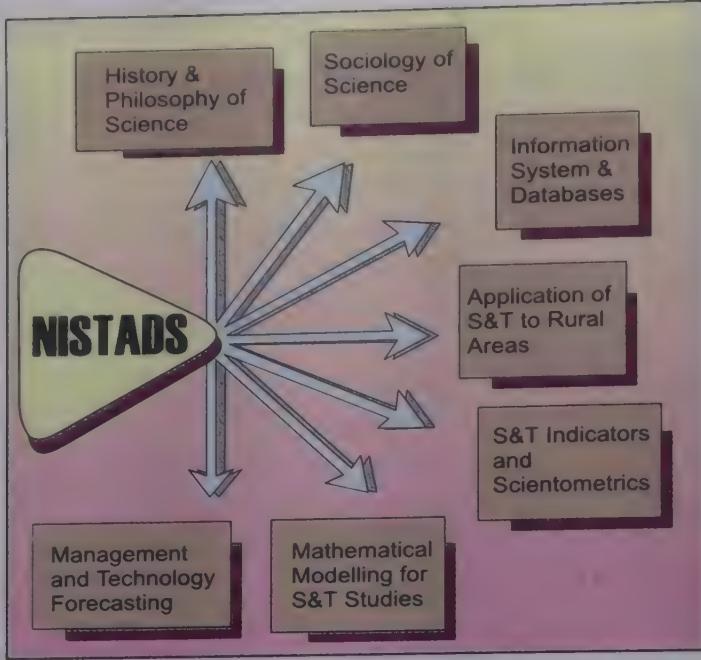
TRAINING PROGRAMMES

NISCOM conducts short-term and long-term training courses in the area of science communication. The short-term training courses include scientific research paper writing, popular science writing and herbarium techniques. Under the long-term training programmes, NISCOM in collaboration with BITS, Pilani conducts M.Phil and Ph.D. courses.

PUBLICATIONS

Annual Report

CONTACT PERSON: Director



National Institute of Science, Technology and Development Studies (NISTADS)

Dr K.S. Krishnan Marg,
New Delhi 110 012

Telephone: 5743227, 5764064
Telegram: NISTADS NEW DELHI
Fax: 5754640
E.Mail: nistads@sirnetd.ernet.in
STD Code: 011
Established: 1981

Director

Prof. Rajesh K. Kochhar

Grant

1998-99

Rs. 460 Lacs

Manpower

Scientific & Technical: 55

Total: 140

MANDATE

- To carry out research in various areas of science and technology studies
- To provide consultancy services and undertake sponsored research and commissioned studies for international and national agencies
- To build, maintain and provide services based on information data banks in science policy areas and archives of science and technology
- To provide training to scholars and functionaries from India and other developing countries in the areas of expertise of the Institute

MAJOR R&D PROGRAMMES

- ★ Technological and social change
- ★ Modelling of S&T and scientometrics
- ★ History & philosophy of science and technology
- ★ Sociology of science

★ Gender studies in S&T

★ Resource Planning and Utilisation for regional development

★ Public Attitude and Understanding of Science (PAUS)

★ S&T Information and Management Systems

SIGNIFICANT ACHIEVEMENTS

- ★ Management of R&D and Intellectual Property: A time bound consultancy assignment was completed for the European Commission. Cooperation with the Science Policy Research Unit (SPRU), University of Sussex, U.K. on 'Exploring the prospects for greater research and technological development cooperation between the European Union and India in Advanced technology sectors'. A project has been completed for the Technology Information Forecasting and Assessment Council (TIFAC) on the preparation of technical guides and reports on management of intellectual property rights in R&D institution.
- ★ Purposeful organization of programmes for IAS officers on 'Science and Technology in Development' sponsored by the Department of Personnel and Training, GOI and another orientation programme for managers of science and technology.
- ★ Modelling of S&T, Scientometrics and S&T Indicators: National Mapping of research publications was undertaken and National & International collaborative linkages of Indian research publications were studied for National Information System for Science & Technology. Growth of Indian Research Publications was modelled using various mathematical models for trend analysis.
- ★ The work on Indian S&T indicators depicts the generation and dissemination of scientific research on linkages, technology transfer and S&T information, public perception and MP's attitude towards Indian Science and Technology and the quality of Indian Science

and Technology and its international comparisons. Data on manpower and infrastructural resources devoted to R&D has also been provided.

- ★ Regional and Rural Development through S&T: The main objective of studies is two-fold: elucidation of theoretical concepts and analytical framework required for planning, management and utilization of regional resources; and application of science and technology for rural areas.
- ★ Advanced scientific spatial technologies like remote sensing and geographic information system have been used with the methodologies of planning and implementation as aids for decision-making. Monographs have been brought out on "Ecodevelopment of Degraded Aravalli Forests" and "Change Detection in Wastelands". Application of Science and Technologies for Rural Areas involved upgradation of traditional technologies and their diffusion in the areas of pottery, fishing hook, brass and bell metal, leather, rural wool and weaving of Baluchari Saree.
- ★ History and Philosophy of Science and Technology: A book on "Nature and the Orient: Environmental History of South East Asia" was brought out.
- ★ Public Attitude and Understanding of Science (PAUS): In this area, a survey of response of children to S&T coverage in media was carried out for UNICEF. Surveys of opinion on S&T of Scientists, Engineers, Parliamentarians on S&T etc. were also carried out.
- ★ Technological and Social Change: In Technological & Social Change, innovation indicators were developed based on the study of vari-

ous industrial units located in the Delhi capital region.

- ★ Programmes at 13 locations were undertaken for social design of technologies relevant for network of rural & semi-urban entrepreneurial networks.

SERVICES OFFERED

S&T policy-related studies and analysis undertaken on: planning, organization and management of science; social relations of science; application of Geographic Information System for sectoral planning at regional level; technology development, acquisition and transfer including comparisons between countries/regions; Bibliometric studies to determine global excellence centres, institutional & subject linkages, historical trends etc. and women in S&T.

Information system design/setting up databases for: S&T Indicators; R&D project management; decentralized management of natural resources for regional development; bibliographic and non-bibliographic data; and software development.

Techno-economic surveys for rural development, opinion surveys on S&T related issues.

Information supply on: S&T archival records available in various Indian archives, literature on science policy, S&T indicators; S&T related public issues in India.

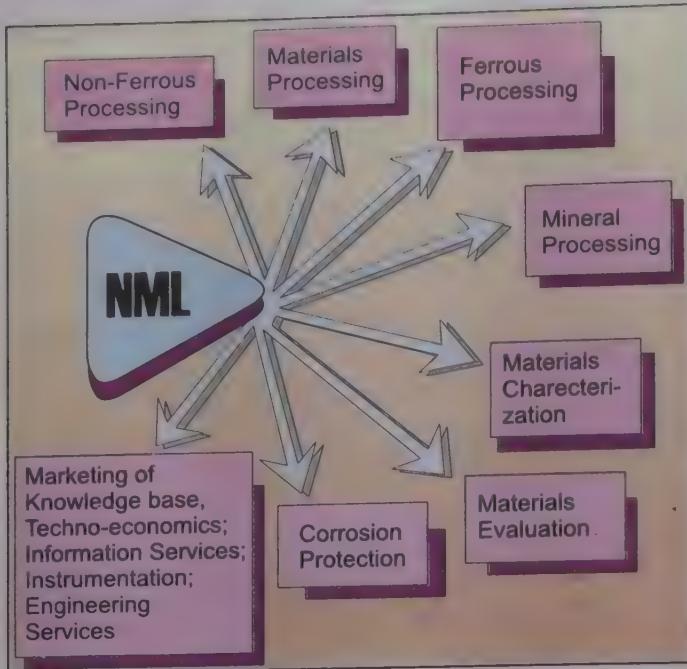
TRAINING PROGRAMMES

Training courses are conducted for scientists and officials from S&T agencies, and central and local government bodies from India and other developing countries in areas of expertise of the Institute.

PUBLICATIONS

Annual Report and Current Literature on Science of Science (Monthly).

CONTACT PERSON: Director



National Metallurgical Laboratory(NML)

Jamshepur 831 007

Telephone: 431131,426091-6
 Telegram: METALS, TATANAGAR
 Fax:426527
 STD Code: 0657
 Established: 1950

Director

Prof. P. Ramachandra Rao

Grant

1998-99

Rs. 1860 Lacs

Manpower

Scientific & Technical:255

Total: 855

MANDATE

- To develop world class expertise and facilities in emerging fields of metallurgy and material science
- To develop competitive know-how for gainful utilisation of minerals, metals, materials and industrial wastes

MAJOR R&D PROGRAMMES

- ★ Ores dressing, mineral beneficiation, material characterization and evaluation of ferrous and non ferrous metals; development, processing and evaluation of alloys; and component integrity evaluation.
- ★ Development of process technology for recovery of nickel, cobalt and copper from hydrometalllic sea nodules through reduction roast, ammonia leaching, solvent extraction and electrowinning
- ★ Beneficiation/purification of indigenous ores
- ★ Development of reliable methodologies for life prediction and life extension of critical components in power, oil, and steel sectors
- ★ Thermomechanical treatment of steels
- ★ Corrosion protection of materials and
- ★ Mitigation of metallurgical related pollution problems.

SIGNIFICANT ACHIEVEMENTS

- ★ Characterization, processing and/or agglomeration studies on iron ores and other raw materials for practically all the steel plants of the country. Carried out the recent ones being Paradip Steel Plant, Orissa; Rashtriya Ispat Ni-



3* Automated laboratory column flotation cell

gam, Vishakapatnam; and Durgapur Steel Plant

★ Froth flotation plants have been set up based on the Lab's knowhow for recovery of fine coal values at the washeries of TISCO (Jamadoba, West Bokaro), CCL (Gidi) and BCCL (Dugda)

★ Copper plants based on flow sheets have been set up at Rakha and Malanjkhand, GMDC (Kadi-pani, Gujarat) and MPMMC (Chandidongri, MP).

★ India's first commercial plant for producing magnesium has been put up by Southern Magnesium and Chemicals Ltd. Rajamundry(AP).

★ The national creep testing facility of the Laboratory has generated a comprehensive database on the high temperature (creep) behaviour of all indigenous steels to power plants and methodologies



Control panel for Laboratory column

of estimating remaining life of power plant components

★ Development of new grades of manganese containing steels for high temperature use

★ The production of low carbon ferro alloys technology used in a number of units producing Fe-Mo, Fe-W, Fe-V, Fe-Mn, Fe-Cr alloys

★ Developed technology for production of battery grade manganese dioxide. A 50 kg/day pilot plant has been set up in Rangoon, Myamamar.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

★ Metasave - a multipurpose inhibitor

★ Sintered alumina

★ Vanadium pentoxide from alumina sludge

★ Aluminium anode - Superal & Hopal

★ Electric grade aluminium alloy conductor NML-PM2

★ Distilled Zinc dust

★ Fluxes for submerged arc welding

★ Graphite Crucibles - carbon bonded

★ Equiblast-cum-balance blast cupola

★ Heating Elements (Cable Works (i), Faridabad; Heatwell (ii), Calcutta)

★ Mini cupola and equiblast cupola designed and developed are in use in by small-scale foundries in the rural area

★ NML Galvasave

★ Galvaflux

★ Fly ash based wear resistance ceramics

★ Ni free exhaust steel valve

★ Calorizing of steel pack cementation

★ Copper powder for electrical and electronic components, welding electrodes, etc.

★ Gas cleaning system for foundries

TECHNOLOGIES READY FOR TRANSFER

★ Tiles from industrial wastes;

★ Direct reduced iron by VRDR process;

★ Electrolytic manganese metal;

★ Ceramic crucible for carbon and sulphur determination in metals;

★ Ceramic magnets;

★ Alumina-based wear-resistant ceramic products;

★ Stainless steel powders;

★ Vapour phase inhibitor;

★ Zinc oxide from zinc waste;

★ Calcium silicide;

★ Steels for portable generator from micro alloyed steel sheets;

★ Calorizing process;

NML



Gas cleaning system installed at IISCO, Kulti



Transmission electron microscope for characterisation studies



Automatic Image Analyser used for quantitative mineral analysis of ores & concentrates

- ★ Extra fine non-ferrous metal powders;
- ★ Recovery of tin from secondary sources;
- ★ Synthetic cryolite;
- ★ Alkali & ethyl silicate;
- ★ Zinc rich primer;
- ★ Vinyl coated steel and aluminium;
- ★ Passivator for galvanized surface;
- ★ Refractory cement (Fondu type);

- ★ Aluminium conductor-NML-PM 215;
- ★ Copper clad aluminium sheets;
- ★ Hot dip aluminizing;
- ★ Creep resistant steels for thermal power plants;
- ★ Cr,Mn,N,C,W,Mo creep resistant stainless steels;
- ★ High speed cast steel cutting tools and Lead from lead concentrate.

FUTURE PROGRAMMES

- ★ Technology for production of clean coal from coking and non-coking coals of India
- ★ Advanced steel-based on ultra low carbon
- ★ Ultra high-energy hard magnets based on Fe, Nd and B
- ★ Software packages for life prediction models for engineering components exposed to fatigue, creep fatigue, and heat and mass transfer models for different metallurgical processes
- ★ Silicon carbide composites (whisker and particulates); iron-aluminates for creep resistance; tubular alumina refractories; SG iron using elemental magnesium
- ★ Industrial waste utilization, pollution and control measures

SPECIAL FACILITIES

Pilot Plants: Mineral beneficiation facilities (0.5-5 tonnes/hour), VRDR, 500 kVA submerged arc furnace

Material shaping units: Rolling mill forging unit, wire drawing unit, extrusion press

Mechanical properties: Creep testing (218 points), tensile bending (MTS, INSTRON), fatigue (Vibrophore), impact (instrumented & conventional)

Analytical: XRF, DRS, AAS, XRD instruments

Physico-chemical characterization: DTA/DTC, DSC, magnetic, thermal

and electrical properties; automatic image analyzer

Furnaces: Submerged arc furnace (50 kVA), rotary kiln, other melting units (arc, induction resistance furnaces), 60 kg vacuum induction furnace

Microscopic characterization: Optical, SEM, TEM

Non-destructive evaluation: Ultrasonic, 8-channel acoustic emission, eddy-current, micro magnetic Barkhausen emission

Mineral beneficiation: Hydrocyclone, magnetic separator, Barties Mozley unit, flotation cell, particle size analyzer, mineral microstructure characterization facilities

Refractories: Characterization, mechanical behaviour, specialized furnaces

Instruments for characterizing corrosion behaviour: Polarization behaviour, stress, corrosion, inhibitor (liquid, vapour and gas phase)

SERVICES OFFERED

Production and supply of standard reference materials for chemical

analysis. It has also supplied samples to Germany, reference materials supplied are: Steel, 0.57 Carbon (No.13.4), Low Alloy Steel (No.23.4), Ferro Chrome (No.30.1), Iron Ore (No.61.2).

Testing of metals and minerals (analytical, mechanical, metallurgical, magnetic) and refractory materials. Literature search and information services relating to metals, materials & Minerals.

PUBLICATIONS

Annual Report; Brochures/reports/proceedings of seminars, symposia, workshops; Special publications, NML News — a quarterly in-house bulletin. NML Technical Journal - a quarterly research journal.

CONTACT PERSON: Director

Field Station

NML Centre
CSIR Madras Complex
Post TTTI Taramani
Chennai 600113
Tel: 2350077, 414956

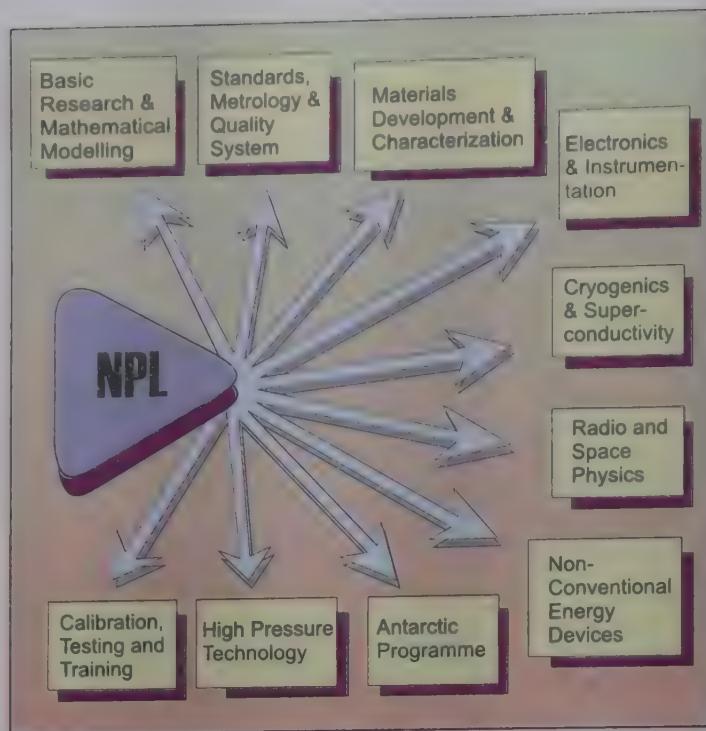
NML Field Station
Industrial Estate
P.O. Batala
Punjab 143505
Tel: 42017

NML Field Station
Industrial Estate
P.O. Baltikuri
Dist. Howrah
West Bengal 721428
Tel: 6670866

NML Field Station
Industrial Estate
P.O. Naroda
Ahmedabad 382330
Tel: 2821386(O)
2860637(R)

NML Marine Corrosion Research Station,
Digha, Dist. Midnapore
West Bengal 721428
Tel: 66340,66295

NML Regional Liaison Centre
4, India Exchange Place
(7th Floor), Calcutta 700001
Tel:2203054,4665466



National Physical Laboratory (NPL)

Dr K.S. Krishnan Marg,
New Delhi 110 012

Telephone: 5741440
Telegram: NATPHYLAB
NEW DELHI
Fax: 5752678, 5769189
E.Mail: npl@sirnet.ernet.in
STD Code: 011
Established: 1950

Director
Prof. A.K. Raychaudhuri
Grant
1998-99
Rs. 2660 Lacs
Manpower
Scientific & Technical: 270
Total: 1140

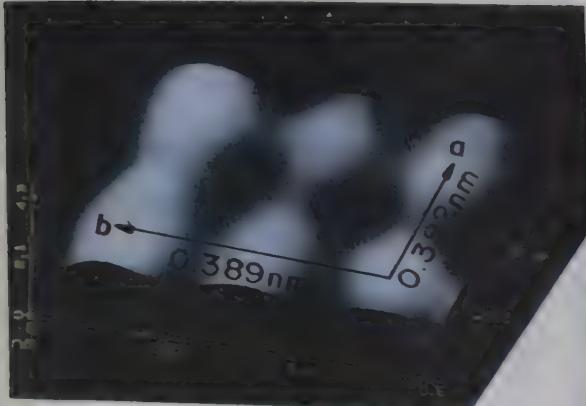
MANDATE

- To establish, maintain and improve National Standards of measurements, and to realize the units based on international system (under the subordinate legislation of weights and measurements Act 1956 reissued in 1998 under the 1976 Act)
- To carry out R&D work with a view to advancing the frontier of knowledge in various areas of physics and its application for the technological advancement.

MAJOR R&D PROGRAMMES

- ★ Measurements standards and calibration
- ★ Electronic & Engineering Materials
- ★ Radio and atmospheric physics
- ★ Cryogenics and Superconductivity
- ★ Applied projects like thin films, Optical Coating, Xerox Radiography, High Pressure metal forming and high-powered Ultrasonic systems and Underwater acoustic devices
- ★ Non-conventional Energy Devices

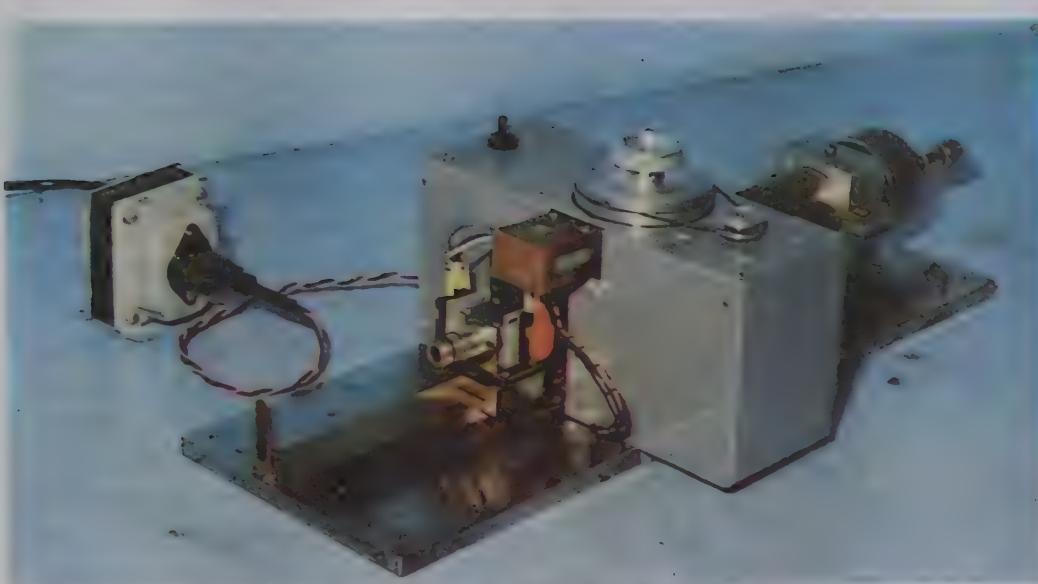
- ★ Theoretical Condensed Matter Physics
- ★ Establishment, maintenance and updating of national standards of physical measurements at internationally accepted levels of accuracy. Under the Subordinate Legislations of Standards of Weights & Measures Acts, NPL has the responsibility of realizing the units of physical measurements under the International System and of establishment, custody and maintenance of 'National standards' of measurements of these units (except for ionizing ra-



Zeeman split frequency stabilised 633 nm He-Ne lasers



Magnesium Alloy (ZK30) square tube for space application



WBCO Attenuator



Oval shaped tube for advanced light helicopter

diations, which are maintained at BARC-Bombay).

SIGNIFICANT ACHIEVEMENTS

BIOMOLECULAR ELECTRONICS AND CONDUCTING POLYMERS

- ★ **Glucose Biosensors:** A third generation glucose biosensor based on physically immobilised glucose oxidase in polypyrrole has been developed.
- ★ **Urea Biosensor:** Immobilization of urea in polyaniline Electro-chemically prepared films has been carried out. It has been found that upto a maximum of two units can be immobilized in these films. The potentiometric response of



The HTS silver clad BPSCCO (2223) tape



APMP Comparison of LF Voltage (1996-97)

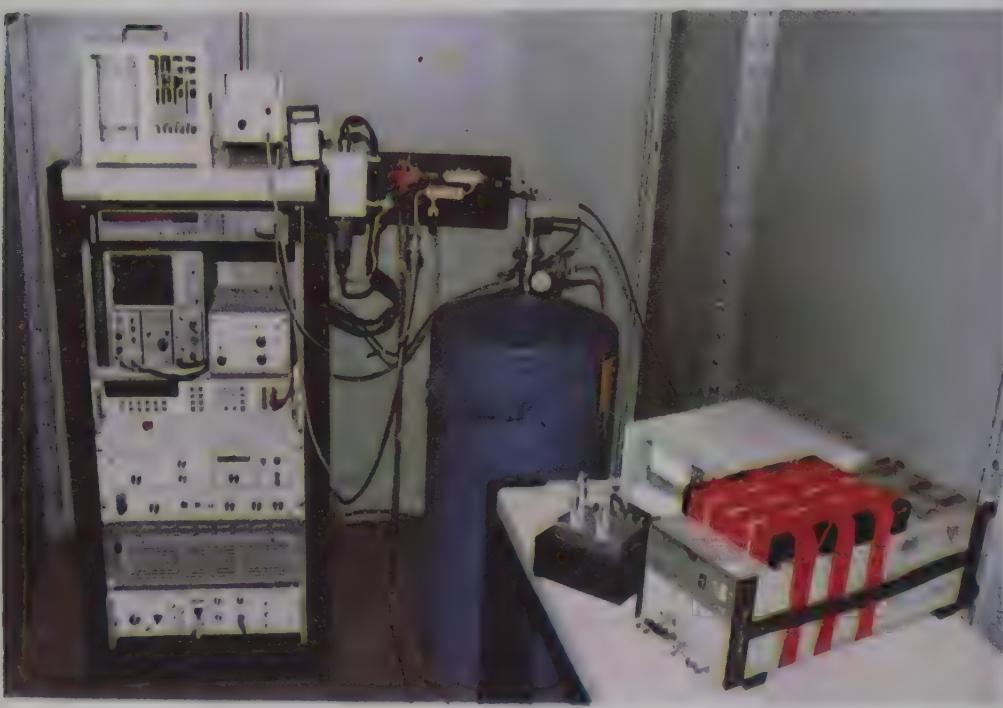


APMP Comparison of RF power (1996)

ULTRASONICS

- ★ A problem of detection and location of small defects in coaxial carbon fibre composite (CFC) material of varying Light Combat Aircraft (LCA) was solved under contract research for Aeronautical Development Agency(ADA). Specially designed transducers were made for this purpose to give a-6db beam diameter of 2.5 mm throughout the sheet thickness with high transmitting and receiving sensitivities. Further systematic studies led to the development of "BWE Gatting technique" which gave very high and almost equal near surface resolution for both front and rear surfaces.
- ★ An improved transducer probe for ultrasonic nondestructive testing of concrete and like materials having it's frequency in the vicinity of 50 kHz and based on sandwich configuration was designed, fabricated and evaluated for performance on concrete samples.

- ★ A complete tunable acoustic receiver was fabricated for 40 - 120 kHz with audio output using surface mount components and PCB. The device was tested on the indigenous 75 kHz pinger tag, developed earlier, from a range of 20 m. The acoustic receiver within the pinger tag was successfully demonstrated in operation at Research Centre of Central Marine



Set up for NPL unit of DC Volt based on Josephson effect

urease-polyaniline electrode has been determined as a function of urea concentration. The electrodes are presently sensitive upto 9mM and are stable for about seven days.

★ **Lactate Biosensor:** Immobilization of lactate dehydrogenase (LDH) in Electro-chemically prepared poly-

aniline (PANI) films has been conducted using physical adsorption technique.

★ **Cholesterol Biosensor:** Cholesterol oxidase (COD) and peroxidase were respectively immobilized in tetraortho-silicate(TEOS) (sol gel films) by micro encapsulation technique.

Fisheries Research Institute, Tuticorin (T.N.)

- ★ The standardization of ceramic composition of piezoelectric material based on Lead Metaniobate (PbNb O) and optimization of ceramic processing parameters for the fabrication of modified lead Metaniobate piezo-electric ceramic material resulted in a material designated as NPLNM-1 equivalent to Vernitron - PMN-1, EDO-EC-82 and kezite-K-81 possessing the following dielectric, electrical and electromechanical parameters.

THE 633 NM HE-NE LASERS

Development/fabrication of Zeeman split frequency stabilized 633nm He-Ne Laser source for precision laser based instrument, has been successfully completed. Commercially viable four units of this laser have been fabricated.

- ★ High Temperature Superconducting Wires/Tapes: The work was done in two main directions: (i) The fabrication of long length silver clad BPSCCO mono-filamentary, (ii) Fabrication of multi-filamentary silver clad BPSCCO tapes. Multifilamentary (6-7 filaments) tapes upto 2 meters length were successfully fabricated.
- ★ These tapes were sintered at 830-845 °C for 250 hours with intermittent rolling A J of 6000 A/cm upto 35 cm gauge length at 77 K and self-field was recorded. End to end superconductivity was observed upto 1.25-meter length.

- ★ Silver clad mono-filamentary or multi-filamentary tapes were made by the PIT (power-in-tube) method. The mono filamentary tape was finally sintered at 810-840°C for 250-300 hours. Process parameters were optimized for long length tapes. Several coils made of 5-10 meters long tape were fabricated. These coils

showed end to end superconductivity upto 10 meter length with a critical current density of approximately 4000-5000 A/cm at 77K in self-field.

- ★ A new route to study fluorination of high Tc superconductors: (collaboration with the Clarendon Laboratory, Oxford, U.K.). The influence of fluorine ion as additive on the crystal growth from high temperature solution has been studied.

WBCO ATTENUATOR

- ★ A laboratory model of precision variable wave guide below cut-off (WBCO) attenuator Operating at 30MHZ in TE model has been designed and fabricated in 50 ohm coaxial system using precision cylindrical copper waveguide for attenuation range of 0-100 db. Resonant inductive antennae matched at 30MHZ have been fabricated and incorporated in the cylindrical wave guide in such a way that one serves as fixed transmitter and the other as moveable receiver for changing the attenuation. A faraday screen type mode filter has been fabricated to suppress the unwanted TM mode generated in the wave guide from the transmitting antenna to an attenuation level of 60db reducing the non-linearity error to a negligible level. The WBCO attenuator has been approximately 20db insertion loss and has been calibrated against a 10db fixed standard coaxial attenuator in steps of 10db over the 0-60 db range. The results were found to lie within 0.01/10db.

- ★ "Development of oval shaped tube for Advanced Light Helicopter as Skid Landing gear" for HAL. The initial feasibility have been completed as prototype (reduced scale) oval tube one meter in length has been successfully produced.

UNIT OF DC VOLT BASED ON JOSEPHSON PHENOMENON:

- ★ The primary standards of voltage at 1 volt which is based on a quantum phenomenon, the Josephson's effect in superconductors have been established.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Particle size Analyzer
- ★ A Tele clock
- ★ Oven controlled crystal oscillator
- ★ Recovery of silver from waste Hypo solution
- ★ Silver impregnated graphite

SPECIAL FACILITIES

Calibration of co-axial and wave guide attenuators and co-axial unis-mathes

Testing of various X-band microwave components and instrument such as VCWR meter, Gunn oscillator and Klystron oscillator power supplies

Apex level calibration of H-sensors, Fluxmeter etc. and measurement on soft magnetic material (facilities being established)

A big electromagnet with 25 cm pole diameter and variable air gap for calibration of H-sensor search coils etc. (being installed)

Facilities for calibration of 1 ton and 10 ton weighing system

Facilities for the calibration of IR line scanners, thermovision systems and wavenumber standard

Computerized facilities with current set-up inter-comparison of two iodine stabilized HE-NE laser by Matrix measurement technique. Frequency calibration of secondary standard HE-NE lasers

Variation of beat frequency in a tuned sale

Short term and long term stability estimation by Allan Variance Method (graphic)

NPL

Angle measurement facilities by photo electric auto-collimator resolution, 0.05 sec of arc

Facilities for crystal growth by low thermal gradient Czechoslovakian method and growth of bismuth germanate crystals

SERVICES OFFERED

Services in the areas of physical measurements, radio communication, characterization of materials, acoustic material, superconducting material and devices.

Calibration of measurement standards and measuring instrument and equipment to highest level of accuracy.

About 4000 certificates relating to calibration, developmental testing

and analytical work are issued every year.

The laboratory has the responsibility of co-ordination of calibration activity in the country for implementation of its National programme of accreditation of laboratories. Presently laboratories are accredited as per ISO-guide 25 requirements. This programme is operated under the National Accreditation Board for Testing and calibration Laboratories (NABL).

Broadcasts of standard time & Frequency Signal (SFTs) via INSAT make it possible to achieve time and frequency synchronization of a very high order anywhere in India.

TRAINING PROGRAMME

The Laboratory conducts training courses in the areas of Dimensional

Metrology, Temperature standards, Infrared Instrumentation Techniques, Calibration of length and angle standards for persons from developing countries, Industry, testing and Calibration laboratories in India.

Students from different Universities, Laboratories, Engineering Departments are also trained in different fields.

PUBLICATIONS

Annual Report

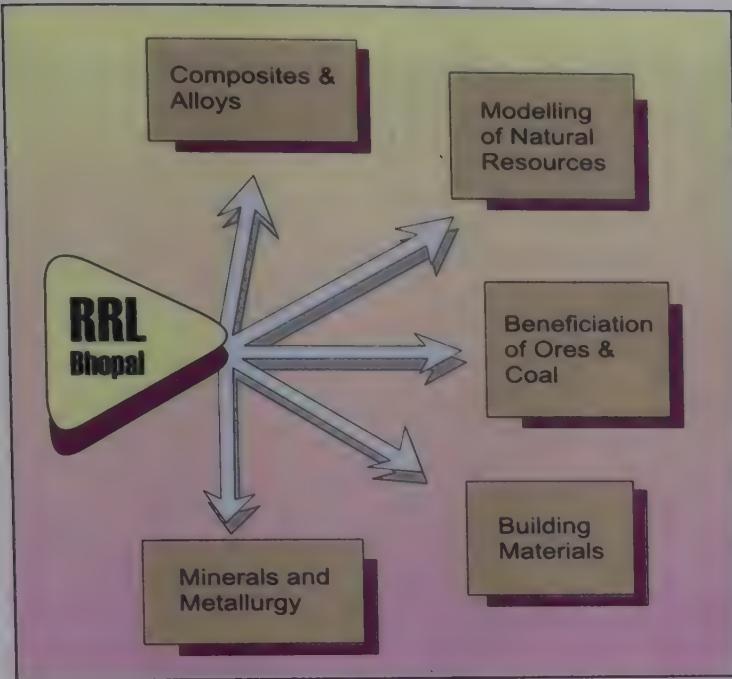
NPL-Info (monthly)

NPL Technical BULLETIN (quarterly)

Sameeksha (quarterly)

Ionospheric data (quarterly)

CONTACT PERSON: Director



Regional Research Laboratory (RRL-Bhopal)

Hoshangabad Road, Near
Habibganj Naka, Bhopal 462 026

Telephone: 587105, 580836
Telegram: RESEARCH, BHOPAL
Fax: 587042, 580985
E.Mail: rrlbho@sirnetd.ernet.in
STD Code: 0755
Established: 1981

Director
Prof. T.C. Rao
Grant
1998-99
Rs. 465 Lacs
Manpower
Scientific & Technical: 55
Total: 130

MANDATE

- To conduct R&D, undertake contract research and offer technical services in the areas of building materials, metallurgy and materials science, minerals, environment and resources development.
- To provide input for regional S&T problems.

MAJOR R&D PROGRAMMES

- ★ Low cost/alternative building materials & components, housing, flyash utilisation, natural fibres and polymers, advanced evaluation and design of components.
- ★ Al-alloy composites, tribology, farm & mining implements, squeeze casting, welding, RSP and foundry techniques, ceramic fibres and whiskers, engineering failure analysis, corrosion.
- ★ Beneficiation of low grade ores, coal preparation, process modeling, environmental studies, in-

cluding EIA, hazard assessment etc.

- ★ Groundwater resources management, watershed development, contamination studies, planning, technology transfers.

SIGNIFICANT ACHIEVEMENTS

- ★ Development of Wood substitute materials and components based on industrial wastes such as flyash and red mud.
- ★ Aluminium alloy matrix particulate composite components for automobile and engineering components, like brake drum, brake disc,



RESCA Brakedrum for a Jonga jeep



Red mud polymer composite door — A wood substitute product



Bush bearings of SLIZ alloy

cylinder liner block, slurry pump impeller, vortex finder, components minerals dressing equipments.

- ★ Development of FRP gear cases and successful field trials by Railways for 2600 hp Diesel locomotives.
- ★ Plant level trials of innovative mineral/coal preparation techniques like Vorsyl separator, water only cyclone, multigravity separator, air sparged hydro-cyclone tried and efficacy proved at various process units and coal washeries. Groundwater resources management, contaminant movement, application of Geographical Information System (GIS) to develop decision support system, water management for sericulture farms.
- ★ Utilization of flyash in land development for agriculture, studies on long term effects of flyash application in agriculture.
- ★ Remaining life assessment, life extension studies for thermal power plant components, and structures.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ RMP doors
- ★ Ceramic fibre preforms
- ★ SLIZ alloy bearings

TECHNOLOGIES READY FOR TRANSFER

- ★ Alternative building materials/components like clay flyash bricks, red mud cementitious binder, natural fibre cement roofing sheet.
- ★ Ceramic fibre preforms
- ★ RESCA brake drums for jeeps
- ★ Bearing material based on SLIZ alloys

SPECIAL FACILITIES

Modern equipment and instrumentation for chemical analysis, minerals processing, mechanical testing and metallography in addition to well-equipped foundry and workshop. The equipments include: Scanning Electron Microscope, X-ray Diffractometer with PC-APD software, TAS Plus Image Analyzer, Atomic Absorption Spectrometer, DCP Spectraspan, Simultaneous Thermal Analyzer, Particle Size Analyzer, INSTRON Universal Testing Machine, Strees Rupture Testing Machine, Friction and Wear Test Machine, Rubber Wheel Abrasion Tester, Gas Jet Erosion Tester, Bearing Test Rig, Talysurf Apparatus, Fatigue Testing Machine, Melt Spinner, 150 T Hydraulic Press, High Temperature Furnace, Plasma Spray Unit, Computerised Hysteresisgraph, Magnetic Particle Test Equipment, Ultrasonic Flow Detector QFT 2 +, Ultrasonic Thickness Gauge DME DL, Portable Non-contact Thermometer, Portable Hardness Tester, Vibration Meter.

Leaf Area Index Meter (ELE International AM 100), UV-Spectro Photometer (GBC-911), Moisture Measuring System (6050 X 1 trase - USA), Portable Soil Analysis Kit (Palintest - 5000 ELE International), Orion ion analyser (Model 290 A), high volume sampler, weather monitoring kit, stack monitoring kit, zero head space extractor, portable spectrophotometer (Hach DR/2000),



Fly ash utilization in land development for agriculture — A view of field at NTPC station where experiments were conducted

gaschromatograph mass spectrometer.(GCMS).

Mozely Multi-Gravity separator, willey table, water-only cyclone, heavy media cyclone, vorsyl separator, flotation cells and columns, air-sparged hydrocyclone, Kelsey jig.

Time Domain Reflectometre-Soil Moisture Measuring System, Guelph Permeameter.

A centre for characterisation of building materials is set up at RRL with support from the Building Materials Technology Promotion Council (BMTPC), DST and CSIR.

SERVICES OFFERED

Consultancy services and technical services comprising testing and analysis, training, assistance of advisory nature, etc.: Major areas are specialised materials testing, engineering failure analysis, building materials characterisation, minerals processing, environmental impact assessment, environmental auditing, safety auditing, hydrogeological investigation, effluent treatment plant design and user specific software development.

Facilities for dimensional and force calibration are being set up. The facilities will be accredited under NABL scheme of DST.

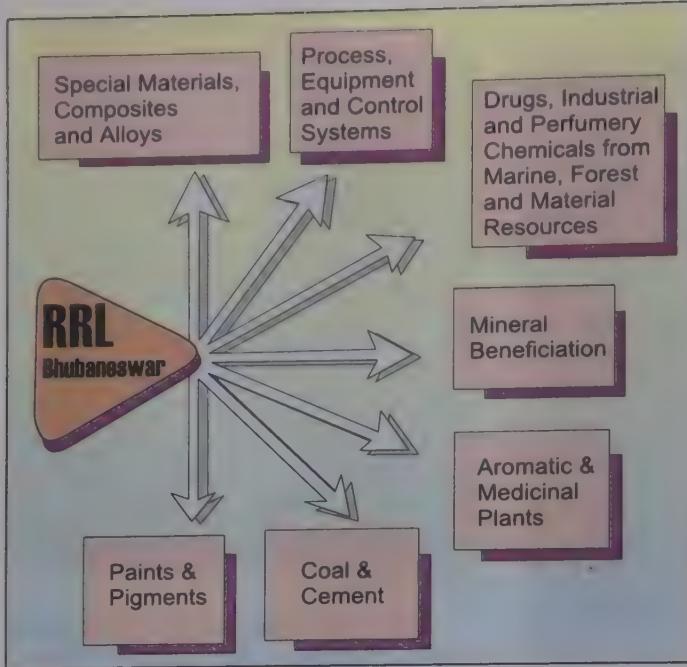
TRAINING PROGRAMMES

The laboratory conducts training courses for personnel from R&D organizations, industry and academic institutions.

PUBLICATIONS

Annual Report.

CONTACT PERSON: Director



Regional Research Laboratory (RRL-Bhubaneswar)

Bhubaneswar 751 013

Telephone: 581126,
581638, 581639
Telegram: RESEARCH
BHUBANESWAR
Fax: 581637, 586126
E.Mail: root@csrrlbhu.ren.nic.in
STD Code: 0674
Established: 1964

Director

Dr H.S. Ray

Grant

1998-99

Rs. 1065 Lacs

Manpower

Scientific & Technical: 130

Total: 360

MANDATE

- To Characterize minerals, beneficiation of lean and complex ores and agglomeration of ore fines and concentrates.
- Pyro-and hydro-metallurgical extraction of metals, preparation of alloys and recovery of metal values and composites.
- To Develop special materials and composites
- To Prepare and synthesize organic and inorganic chemicals from marine, forest and mineral resources.
- To Design and develop process equipment of control systems
- To Survey, introduce and utilization of aromatic, medicinal and other economic plants.

MAJOR R&D PROGRAMMES

- ★ Mineral processing, extractive metallurgy (Pyro and hydro), preparation of special materials and alloys, design and project engineering, preparation of inorganic and organic chemicals (including pigments, drugs, pharmaceuticals and perfumery chemicals); survey & cultivation of aromatic, medi-

nal and other economic plants; and development of new analytical methods.

SIGNIFICANT ACHIEVEMENTS

- ★ Commercial plantation of Palmarosa
- ★ Computer softwares development for X-ray emission spectra



Tapping of rubber at the experimental garden



Agriculture equipment (Winnower-cum-Thrasher)

- ★ Conversion of existing oil fired furnace into a coal fired one by redesigning the entire system for a Re-rolling Mill of Industrial Development Corporation of Orissa Limited
- ★ Setting up of 75 TPH ore crushing and screening plant for M/s Orissa Mining Corporation Limited
- ★ Commissioning of Sewage based Bio-Gas Plant
- ★ Improved distillation unit for Kewda flower distillation
- ★ Synthesis and characterisation of mesoporous Zirconia
- ★ Recovery of cobalt from super-alloy scrap
- ★ Bio-chemical leaching of low grade manganese ore
- ★ Preparation of highly pure iron oxide
- ★ Design of an electrowinning plant for nickel
- ★ Basic engineering of solvex-electrowinning plants for cobalt

- ★ Microbiological control of iron in solutions
- ★ Flow sheet development for treatment of various ores and minerals
- ★ Mineralogical and geochemical studies on auriferous quartz veins
- ★ Utilisation of fly ash for light weight aggregate and cement clinker for construction purposes
- ★ Reduction roasting of oxidic nickel ore in fluidized bed
- ★ Decarburisation of pig iron
- ★ Upgradation of manganese ore and removal of phosphorous from high iron and high phosphorous manganese ore
- ★ Plasma synthesis of industrially important carbides such as SiC, WC, TiC and fused WC
- ★ Plasma decomposition of molybdenite and preparation of ferro molybdenum
- ★ Plasma heat affection studies on blue dust and iron ore super concentrate for ferrite making
- ★ Utilization of East Coast ilmenite
- ★ Reduction roasting of oxidic nickel ores in fluidised bed

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Preparation of soft ferrite and Mn-Zn ferrites through the aqueous route
- ★ Preparation of molybdenum by thermal decomposition of molybdenum in a transferred arc plasma reactor & preparation of ferro-molybdenum
- ★ Process development and designing of a cobalt plant
- ★ Bio-beneficiation studies of Fe-mn slag for alkali removal
- ★ Utilisation of ferro manganese slag
- ★ Study of (i) Blue dust and (ii) Iron ore super concentrate using thermal plasma
- ★ Optimisation of performance of tamin graphite beneficiation plant
- ★ Chemical treatment of papermill black liquor to reduce the BOD level
- ★ Decarburisation of Pig Iron
- ★ Design of solvent extraction electrowinning plant to produce 5kg/day cobalt plant
- ★ Plasma decomposition of molybdenite and preparation of ferro molybdenum

FUTURE PROGRAMMES

Extraction of valuable and strategic metals from ores and concentrates; Polymetallic manganese nodules; Production of ferro alloys through plasma; Commissioning of pipeline for high-concentration slurry transportation; Energy from biomass; Metal recovery from wastes/byproducts of metallurgical and chemical industry; High temperature pigment; Treatment of contaminated soil; Solids and effluents of different mines and industrial sites; Bioactive substances from marine organisms; Agrotechnology for cultivation of aromatic, medicinal and other economic plants like kewda, *Hevea brasiliensis* (rubber), *Simarouba glauca* (aceituns), *Cym-*

RRL-BHUBANESWAR



Column leaching set up for bioleaching of ores

bopogon species, vetiver and patchouli.

SPECIAL FACILITIES

High precision microscopes for mineral characterization studies

Large-scale flotation column for beneficiation of various minerals and coal fines, gravity separation units including Bartle's Mozley concentrators and magnetic separators

Integrated comminution facilities for ores and minerals and studies on energy consumption

Facilities for agglomeration of ore fines and concentrates through sintering, pelletization, briquetting, testing and evaluation of agglomerates



Unit for KEWDA distillation

Rotary kilns, multiple hearth furnace, high temperature Tamman furnace, vacuum induction furnace, etc. for roasting, smelting and melting studies

High pressure batch and continuous autoclaves for slurry leaching

Integrated solvent extraction and electrowinning facilities for extraction of metals from dilute and complex solutions

Solid-liquid separation facilities for generation of engineering data

Special high temperature furnaces, including plasma furnace

Test loops for slurry transportation through pipelines including bench-

scale facilities for material characterization, slurry rheology, dewatering, pumping and mixing studies

Combustion test rig for liquid fuels, acoustic and other types of burner testing

Cyclone combustion test rig

Sophisticated corrosion-erosion testing facilities

Facilities for surface area, porosity and fluorescence measurements and catalyst testing and evaluation

Instruments for physico-chemical characterization of ores, minerals and organic chemicals; XRF, XRD, AAS, IR, UV, NMR, GLC, ion chromatograph, HPLC and densitometer

Herbarium for identification of plants

SERVICES OFFERED

The laboratory offers consultancy services to mining, metallurgical and chemical industries; research and educational institutions. The laboratory also provides analytical and testing services to the industry.

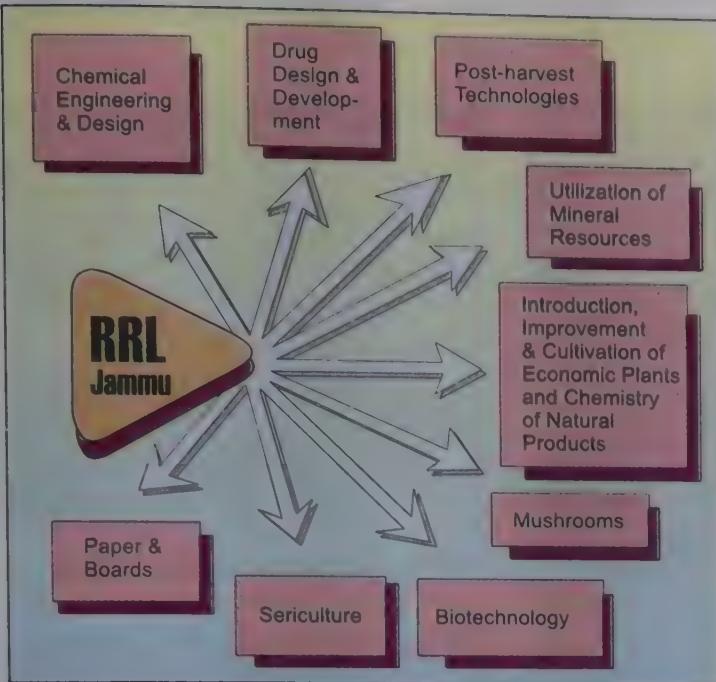
TRAINING PROGRAMMES

Training programmes on cultivation of aromatic and medicinal plants.

PUBLICATIONS

Annual Report, RRL Bulletin (Quarterly)

CONTACT PERSON: Director



Regional Research Laboratory (RRL-Jammu)

Canal Road, Jammu Tawi 180 016

Telephone: 544382, 546368,

547493

Fax: 548607, 543829, 546383

STD Code: 0191

Established: 1957

Director
Prof. S.S. Handa

Grant
1998-99
Rs.1125 Lacs

Manpower
Scientific & Technical: 115
Total: 540

MANDATE

- To carry out R&D work with a view to helping in industrial development of the North-western region of the country
- To help in optimal utilization of natural resources
- To explore and exploit hitherto untapped resources of the region

MAJOR R&D PROGRAMMES

- ★ Natural products and organic chemistry
- ★ Drugs & pharmaceuticals
- ★ Standardisation, quality control and formulation of traditional/herbal drugs
- ★ Process development & engineering design
- ★ Introduction, improvement and cultivation of medicinal & aromatic plants
- ★ Plant survey
- ★ Post harvest technology
- ★ Biotechnology
- ★ Food technology

★ Cellulose pulp & board and utilization of mineral resources

SIGNIFICANT ACHIEVEMENTS

- ★ Developed: A new geraniol rich strain of Jamrosa, *Cymbopogon nardus* var. *confertiflorus*; A new (+) X-bisabolol rich strain, GP-100 of *Cymbopogon flexuosus* (Nees ex Steud) Wats; A new improved methyl chavicol rich variety of *Ocimum basilicum* var. *glabratum*; A new elemicin rich strain of *Ocimum carnosum* Lk. et Otto.
- ★ Process developed for production of:
 - free gluconic acid by a genetically altered organism — a Tn-5



A new (+) α -bisabolol rich strain of *Cymbopogon flexuosus*



A new elemicin rich strain of *Ocimum carnosum*

- transpogenised block mutant of *Gluconobacter oxydans*.
- 2-keto-glucconate, a penultimate intermediate of isoascorbic acid (Isovitamin C) used as an antioxidant for the preservation of food products.
- Kinetic resolution of naproxen an anti-inflammatory drug mediated by a yeast strain (RRL Y-15, isolated and developed in the laboratory), (further scaled up to 25 Kg batch).
- Citronellol from terpenic aldehydes
- Confectionary grade bright white sesame seeds without dehulling
- Aromatic oils from dammar resins
- Terpineols
- Formulation from *Cassia tora* for enhancing fecundity in *Antheraea* species. Synthesis of a quinazolone based potential drug for therapeutic use against bronchial asthma.
- ★ Synthesis of anticancer cyclic acetals from naturally occurring glucosides of podophyllotoxin and 4-demethyl podophyllotoxin
- ★ Simultaneous extraction of essential oils and Rutin from plant materials (standardised)
- ★ Preparation of a pharmaceutical composition with enhanced bioavailability and efficacy for use as immunosuppressant

- ★ Manufacture of hydrogenated rosins and its esters
- ★ Microbial hydroxylation of camptothecin to 10-hydroxycamptothecin
- ★ Agrotechnology for cultivation of *Asparagus officinalis* in plains has been standardised and disseminated
- ★ Protocols for *in vitro* propagation and corm formation in saffron have been developed
- ★ Complete package for quail farming

★ Phase-III clinical trials of bioavailability enhanced antituberculosis formulation AT-3 completed and pre-marketing dossier containing this data submitted to Drug Controller General of India for marketing permission

- ★ A machine for the production of coated medicated threads has been designed and fabricated
- ★ Low cost hand operated, apricot/peach oil extraction machines, viz. seed decorticator, kernel sorters meal grinder, oil extractor
- ★ Formulation for enhancing silk yield in silkworm *Bombyx mori* L.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ★ Agrotechnology for cultivation of Hops in Ladakh region and technology for setting up of Hops drying unit
- ★ Technology for setting up of a dust free chalk making unit
- ★ Agrotechnology for lemongrass
- ★ Technology for conversion of pinenes into terpene alcohols



A new improved methyl chavicol rich variety of *Ocimum basilicum* var. *glabratum*



Multipurpose fermenter assembly



Hand operated apricot seed decorticator



Hand operated screw type oil extractor

- ★ Technical know how on the production of bolder crystals of menthol
- ★ Agrotechnologies for *Ocimum* species; improved variety of lemongrass CKP-25; *Bryonopsis* (Shiv linga) and *Dioscorea composita*

TECHNOLOGIES READY FOR TRANSFER

- ★ Production of particle boards and medium density fibre boards

acetate, pinenes and down stream products ex terpentine oil

- ★ Manufacture of trans-anethole from methyl chavicol
- ★ Foods, jams and jellies for diabetic patients and low-calorie canned fruits and herbal concentrates
- ★ Natural food colours and textile dyes
- ★ Solar-cum-agrowaste drier for drying of Toria oil seeds (10/LPD)
- ★ Design and fabrication of Multipurpose fermenter assembly
- ★ Complete village level package for the production of silk (Leaf to cloth technology)

FUTURE PROGRAMMES

Microbial conversion of steroids and development of microbial products of industrial importance; Natural resources of the region; Herbal drug development; Increasing the silk yield; Insect studies and defence mechanism for developing safe insect control agents.

SPECIAL FACILITIES

A wide range of analytical and characterization facilities, e.g. IR including one FTIR, UV-VIS spectrophotometers, multinuclear NMR 90 MHz (for proton), GCMS, High resolution GCMS, preparative HPLC, C.H. Analyser

Automatic Polarimeter

JEOL 60 MHz, C.n. NMR

Bruker Supercon 200 MHz FT-NMR

Electron Microscope

DNA transilluminator

DX-300, Ion Chromatograph Carbohydrates Analysis System

Isotope laboratory

Pilot plant facilities in the areas of essential oil and other phytochemicals fermentation, food, minerals, papers & boards

Herbarium of the flora of North-west India

RRL-JAMMU

SERVICES OFFERED

Equipment design/fabrication facilities; Testing of drugs, essential oils, minerals and celluclosics and biological standardization of pharmacological products. Supply of seeds, seedlings, plant materials for the cultivation of medicinal/aromatic/economic plants and spawn for mushroom cultivation.

TRAINING PROGRAMMES

Short-term training courses on cultivation of medicinal & aromatic plants, hops, mushrooms, rabbit farming, quail farming, aquaculture, water quality assessment and mineral & plant based products. Training is imparted in the field of sericulture (leaf to silk weaving), post harvest technology on food and food products. Training programmes are also undertaken in the fields of Modern Biotechnology, Quality control & standardisation of herbal drugs and electron microscopy.

Summer training is organised for select number of students from different Engineering and Pharmaceutical Institutions in India, in the fields of mechanical, electrical, electronic & chemical engineering and pharmaceutical sciences.

PUBLICATIONS

Annual Report

Newsletter

Books:

Cultivation & Utilisation of Medicinal Plants

Cultivation & Utilisation of Aromatic Plants

Indian Mushroom Science:II

Chemistry and Pharmacology of Vasicine: A new Oxytocic & Abortifacient

The Essential Oil and Perfumery Industry in North India

Sericulture for Economic Development and Employment (In Hindi)

Illustrated Manual of Herbal Drugs used in Ayurveda

Supplement to Cultivation and Utilisation of Medicinal Plants

Supplement to Cultivation and Utilisation of Aromatic Plants

Monographs:

Himalayan Heracleum Linn.(Hogweed) - A Review (Including Agrotechnology of *H.candicans* Wall)

RRL, Jammu: List of Publications 1958-1982

RRL, Jammu Silver Jubilee (Commemorative Lectures)

Ergot production in India

Hops in India

Rose and Rose Oil Industry in India; a Survey Report

Celery in India

Cultivation of Artichoke

Cultivation of *Dioscorea composita*

Vanaya Shatavari (in Hindi)

Cultivation of Asparagus

Cultivation of Jamrose

Cultivation of Hops

Cultivation of lemongrass

CONTACT PERSON: Director

Branch & Field Stations

Regional Research Laboratory(Branch)

Sant Nagar, Srinagar-190 005

Telephone:0194-431255

Regional Research Laboratory (Extension Centre)

PO Bundla Tea Estate, Distt. Kangra 176061

Palampur (H.P.)

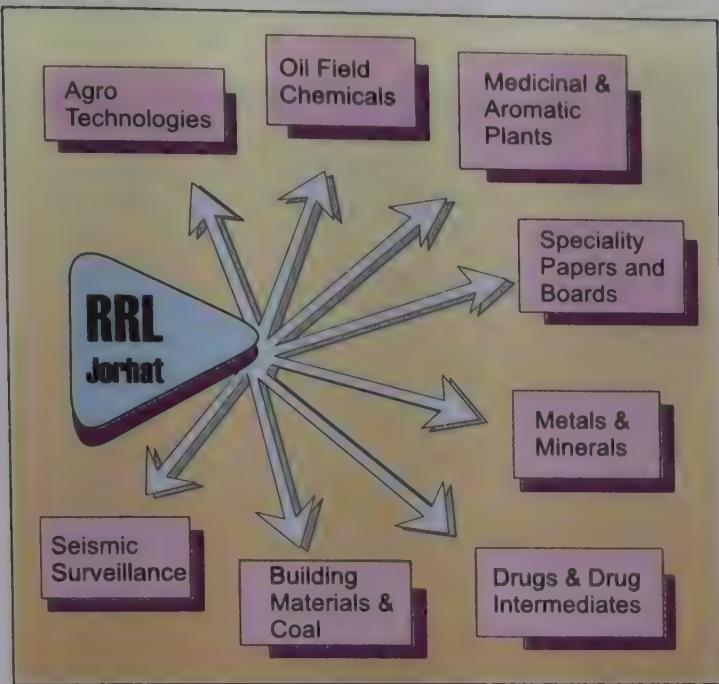
Telephone:01894-30894

RRL Field Research Station (Experimental Farm)

Chatha, Jammu Cantt.

RRL Field Research Centre (Experimental Farm)

Verinag, Kashmir



Regional Research Laboratory (RRL-Jorhat)

Jorhat 785 006

Telephone: 320353
 Telegram: RESEARCH, JORHAT
 Fax: 321158
 E.Mail: rrljh@sirnetc@sirnetd.ernet.in
 STD Code: 0376
 Established: 1961

Director
 Dr J.S. Sandhu

Grant
 1998-99

Rs. 1210 Lacs

Manpower

Scientific & Technical : 105

Total : 555

MANDATE

- To provide R&D inputs for the effective use of material resources of the North-Eastern region and to develop indigenous technologies based on the natural wealth of the region.
- To develop and introduce agro-technologies for improving the economy in the rural areas of the North-East Region.

MAJOR R&D PROGRAMMES

- ★ Development of oil field chemicals, agrochemicals, agrotechnologies for aromatic and medicinal plants
- ★ Drugs and drug intermediates
- ★ Speciality papers and boards
- ★ Inorganic chemicals
- ★ Building materials and Other high value chemical products. Basic research is carried out in the areas of organic chemistry, biochemistry and geosciences.

SIGNIFICANT ACHIEVEMENTS

- ★ Establishment of a network of digital 3D seismic station along with a Central Recording Observatory equipped with remote dial-up facility for on-line data transmission and processing. This has been installed under an enhanced earthquake monitoring programme for studying new perspective on Active Tectonic Lineaments and Associated Seismicity in NE India.

RRL-JORHAT



Fibres from Banana plants



Mushroom farming



Experimentation devicing the development of "Arteether", the anti-malarial drug

★ Development of:

- Know-how for 'Arteether', a potent new generation anti-malarial drug active against Chloroquin resistant malaria strains.
- A new process for the utilisation of Banana plants for production of fibres useful for making twines and fabrics in the conventional jute processing machines and also for making products like carpets, doormats, bags, flower vase, table mats, purse, flower basket, wall hangings, shopping bags, etc.
- Knowledgebase for Bioremediation of crude oil contaminated soil of oil field as measure for restoration of soil and environmental health.
- Rayon grade or high alpha cellulose pulp from fast growing plant resources
- Improved technology for the production of 16-DPA from diosgenin and solasodine.

- Biochemistry of Muga silkworm and its host plants for enhanced production.
- Vertical shaft kiln (VSK) for mini cement plants. Currently 35 mini cement plants are in operation in the country based on RRL-Jorhat technologies. A modified VSK technology for 30,000 TPA plant has also been developed to cater to the national and international needs.
- A series of pour point depressants for transportation of high waxy crude oils
- Agro-technologies for mushroom cultivation and popularisation of several edible mushroom varieties in the North-East India.
- Oil field chemicals/materials e.g., high/medium strength proppants, chrome free lignites, oil well formation stabiliser.
- Agro-technologies for important medicinal and aromatic plants. (The laboratory's contribution to extensive cultivation of citronella grass and extraction of oil have led to the establishment of a major citronella based agro-industry in the north-eastern region. The production of citronella is about 500 tonnes generating employment for 22,000 individual in the rural sector alone).
- ★ Establishment of an ecology park named North-East Ecology Park(NEEP)and introduction of several important medicinal perfumery and endangered plants grown wild in North-Eastern

States. NEEP will act as a gene-cum-research park for plant breeders and biotechnologists.

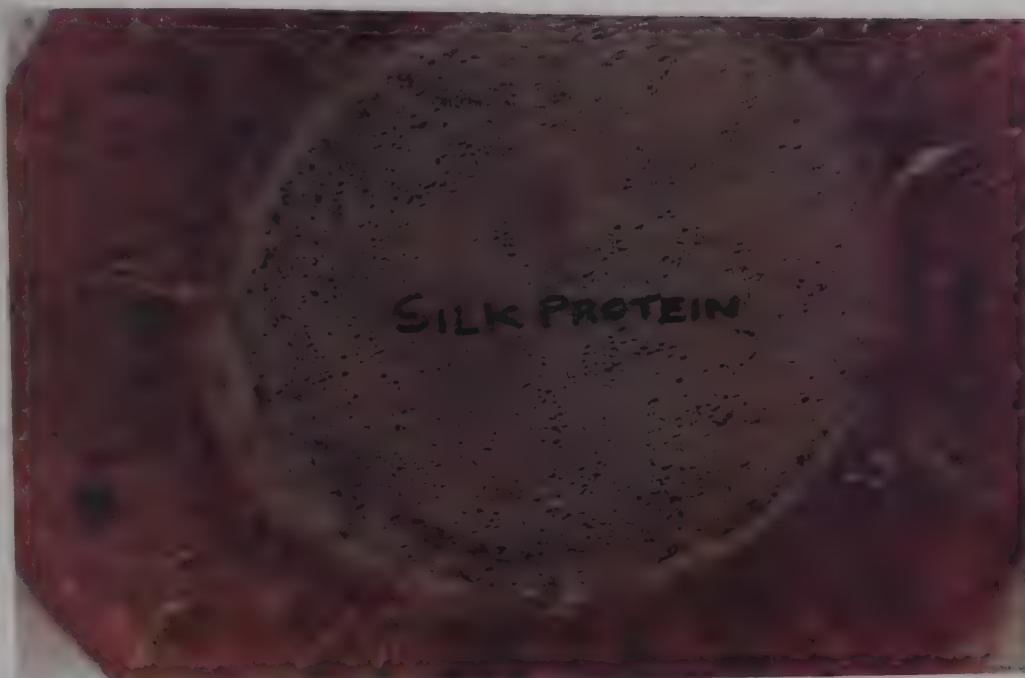
- ★ Multiplication of some medicinal perfumery and endangered plant species by tissue culture.
- ★ Process development for pesticides, e.g. Phosphamidon, Quiinalphos and Chlorfenvinphos isolation and characterization of compounds of plant origin having inseccticidal and antifeedant.
- ★ Process development in the area of speciality papers and boards including thermographic paper, carbonless copy paper, direct copy paper, carbon paper, gummed paper tape and ceiling boards, etc.
- ★ Survey, identification and determination of quality of spice species of North-East India for commercial exploitation.

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- 100 TPD VSK mini cement plants phosphamidon and Quiinalphos pesticides
- Pour point depressants
- 'Arteether', the anti-malarial drug
- Carbonless copy paper, Direct Copy paper and Heat sensitive paper

TECHNOLOGIES READY FOR TRANSFER

- ★ Agrotechnologies: *Java citronella*, *Dioscorea*, Edible Mushroom, *Palmarosa*
- ★ Building Materials: Ceiling boards from agrowaste
- ★ Drug & Drug Intermediates: Caffeine from tea-waste, *Diosgenin* from *Dioscorea* tuber
- ★ Inorganic Chemicals: Beneficiation additives for ores & minerals, Silica gel, Potassium silicate solution (Electronic grade)



Transverse section of the silk gland of *Muga antheraea assama* (4th Day Vth Instar Larva) showing the liquid silk protein inside the lumen of the silkgland (MAG X 200)

- ★ Organic Chemicals: DPT (Rubber blowing agent)
- ★ Oil Field Chemicals: Chrome lignite & Chrome free lignite (Drilling mud additives)
- ★ Petroleum Products: Microcrystalline wax from sucker road wax, paraffin wax from earth
- ★ Stationery Products: Carbon paper, typewriter ribbon, correction fluids, synthetic gum, gummed paper tape, paper slates & boards, plastic slate, printing ink, moulded slates from agrowastes, Coated Papers: File covers, file boards, handmade papers, jacquard board, medium density fibre board
- ★ Designs: Designs for solid waste disposals, multipurpose domestic tools, improved stop-valve and non-return valve for drawing water, wildseed oil expeller, distillation plant for oil bearing grass and leaves
- ★ Drinking water: Water filter candle
- ★ Others: Liquid de-odourant & cleaner, herbal room freshner, wood preservatives

FUTURE PROGRAMMES

Development of anti-cancer, anti-AIDS and other drugs from natural

resources and by synthetic methods; Separation of microcrystalline wax from vacuum residues using Assam crude, Development of chemicals for enhanced crude oil recovery and polymeric drilling mud additives; Development of process know-how for biocides, drugs and drug intermediates; Bioactive principles from plants of the North-Eastern region; Environmental assessment and impact studies and computer-aided upgradation of the VSK mini cement technology.

SPECIAL FACILITIES

High field supercom magnet NMR facility operating at a frequency of 300 MHz of proton having all the units digitally controlled. The machine is controlled by user friendly UXNMR based UNIX operating system and is capable of recording almost all types of spectra in liquids or solutions with a facility for user-defined pulse-programming in C-language interfaced with UXNMR.

Facilities for the analysis and testing of water, soil, sand, metals, minerals, cement, fertilizers, food products, essential oils for earthquake monitoring and prediction related studies

Pilot plant facilities

Patent Inspection centre

SERVICES OFFERED

Contract and collaborative research, consultancy services; Techno-economic feasibility studies, testing and analytical services; (The laboratory has recently completed environmental impact assessment related soil investigation assignment for a galvanising project of SAIL at Dagaon, Rangiya (Assam) for M/s MECON, Calcutta. It has also successfully completed the project on Bioremediation of crude oil contaminated soil of Borhola oil field for ONGC).

TRAINING PROGRAMMES

The laboratory organizes training programme in agrotechnologies of medicinal and aromatic plants and cultivation of edible mushrooms and in the field of welding, fitting and Ferrocement housing technique.

PUBLICATIONS

Annual Report, RRL News and occasionally brochures.

CONTACT PERSON: Director

Branch Laboratory

RRL Branch Laboratory
Itanagar, Naharlagun,
P.O. Itanagar, Arunachal Pradesh
Telephone: 0360-244220

Field Stations

RRL Jorhat Experimental Farm,
Yaongyimse Village,
P.O. Changtongiya
Dist. Mokokchung, Nagaland

RRL Jorhat Experimental Farm,
Mantripkhuri
Dist. Imphal, Manipur

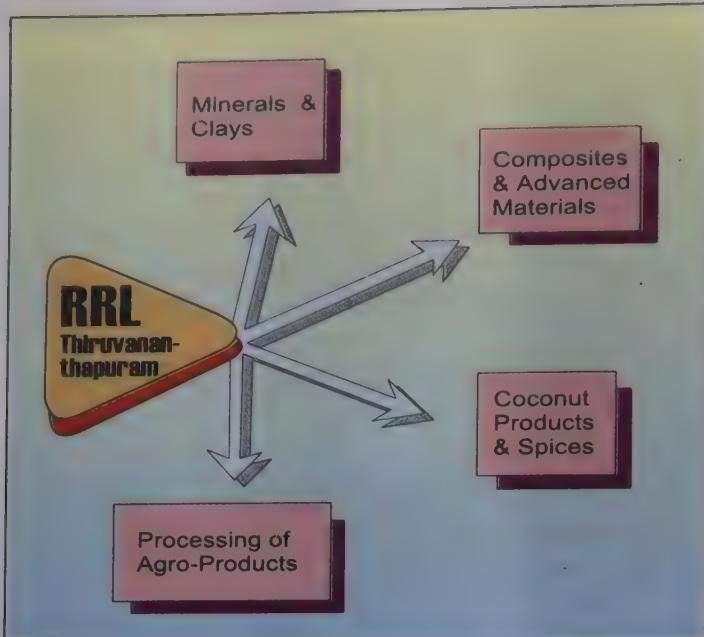
Seismic Surveillance Stations

Conventional Stations

Jorhat, Guwahati, Haflong, Kaziranga, Kohima, Yaogymse, Itanagar, Bomdilla and Khonsa.

Telemetry Stations

Panbari, Jorhat, Chanki, Bhandari, Kongon and Dalmukh



Regional Research Laboratory (RRL-Thiruvananthapuram)

Thiruvananthapuram 695 019

Telephone: 490324, 490674,
490224

Telegram: CONSERCH

Fax: 490186, 491712

E.Mail: rrlt@sirnetm.ernet.in

STD Code: 0471

Established: 1978

MANDATE

- To carry out multidisciplinary R&D work for the optimum utilisation of regional/national resources
- To undertake research work in the areas of environment sciences and waste water treatment
- To undertake advanced and futuristic research leading to generic technologies

MAJOR R&D PROGRAMMES

- ★ Organic synthesis & bioactive molecules
- ★ Beneficiation of clays & value-added products from clays (Clay Catalysts)
- ★ Speciality polymers (including photo polymers)
- ★ Advanced ceramics
- ★ Ecofriendly process for synthetic rutile
- ★ Technology for Turn-Key implementation of palm oil processing

★ Biochemical processing & waste water technology (including Coastal Ocean Monitoring)

★ Aluminium alloys & their cast composites

SIGNIFICANT ACHIEVEMENTS

- ★ Processes for Beneficiation of Clays for Industries and detergent grade zeolites
- ★ Technology for production of high grade synthetic rutile from Ilmenite
- ★ Aluminium sol-gel abrasives process for industrial application

Director

Dr G. Vijaya Kumaran Nair

Grant

1998-99

Rs. 670 Lacs

Manpower

Scientific & Technical : 60

Total : 240



Ilmenite beneficiation at TCC, Cochin



Spices extraction unit



Palm oil processing

- ❖ Superconducting thin films with high J_c values and High T_c novel substrates
- ❖ High fly ash flux bonded building ceramics
- ❖ Flame retardant adhesives for various applications
- ❖ Enzymatic transformation for synthesis of bioactive natural products
- ❖ Technology for palm oil processing
- ❖ Technology for coconut cream processing
- ❖ Indigenisation of premium quality Al castings
- ❖ Development of cast Al composites
- ❖ Technology for coir-polymer composites

TECHNOLOGIES READY FOR TRANSFER

- ❖ Novel slurry extraction for the preparation of fresh flavoured oleoresin from spices
- ❖ Micro-encapsulated spice flavours
- ❖ Photoswitchable liquid crystals
- ❖ A series of flame retardant resins based on CNSL
- ❖ Clay catalysts for Friedel Crafts alkylation
- ❖ Building bricks using tannery sludge and flux bonded fly ash
- ❖ Highly oriented superconducting thin films/substrates of YB₂CuO₃/REBa compounds
- ❖ Semisolid/liquid metal processes for cast Al alloy-graphite/silicon carbide/carbon fiber composites for self-lubricating/structural applications
- ❖ Methodologies for treatment of effluents of agro industries, dairies, latex industries, distilleries

RRL-THIRUVANANTHAPURAM**SPECIAL FACILITIES**

A wide range of facilities for characterisation and analysis of organic/in-organic/polymer materials

For the preparation & characterisation of alloys & composites, ceramic powders and thin films

Mechanical testing & microscopic facilities

Agroprocessing facilities

Clay & Mineral testing & processing facilities

For effluent & water quality analysis

SERVICES OFFERED

Consultancy

Technical Consultancy

Analysis & Testing

Contract Research

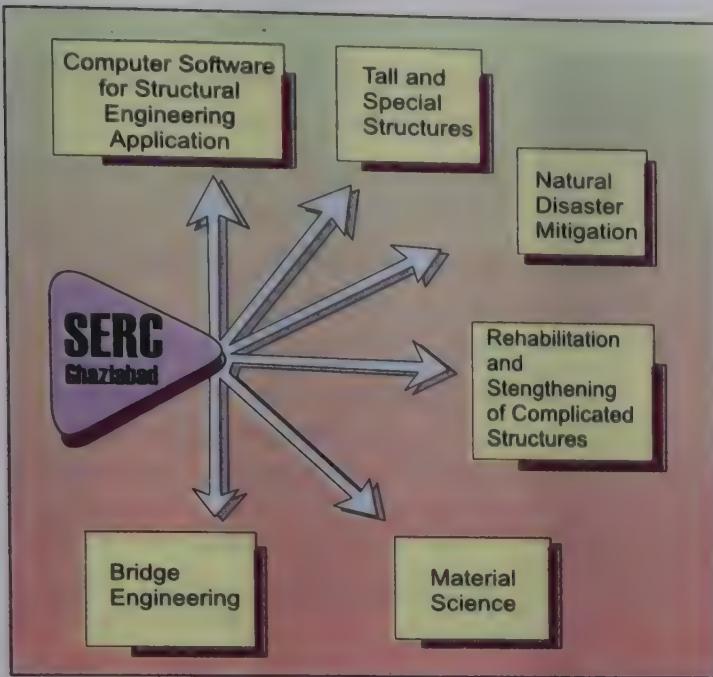
TRAINING PROGRAMMES

Training programme in agro-processing, Clay processing, Quality control aspects etc.

PUBLICATIONS

Annual Report

CONTACT PERSON: Director



Structural Engineering Research Centre, Ghaziabad (SERC-G)

Kamla Nehru Nagar,
Ghaziabad 201 002

Telephone: 721874,713772
Telegram: SERCENTRE GHAZI-
ABAD
Fax: 721882
E.Mail: sercg@sirnetd.ernet.in
STD Code: 091
Established: 1965 (established at
Roorkee relocated at Ghaziabad in
1987)

Acting Director
Shri M. S. Kapla
Grant
1998-99
Rs. 315 Lacs
Manpower
Scientific & Technical (Gr.IV): 37
Total:122

MANDATE

- To undertake basic and applied research on various aspects of structural engineering like bridge engineering, tall structures, wind engineering and special structures, natural disaster mitigation and material science
- To develop comprehensive computer software for structural engineering applications
- To act as an information bank for the expert knowledge and knowhow on the design and construction of a wide range of complex and innovative structures

MAJOR R&D PROGRAMMES

- Tall and large span structures, specially analysis and design of superstructures of bridges, their aerodynamic behaviour, performance monitoring and diagnostics of existing bridges; Natural disaster mitigation related to wind and earthquake.

SIGNIFICANT ACHIEVEMENTS

- Instrumentation and monitoring of Lok Nayak Setu, (ITO Bridge), New Delhi
- Wind tunnel testing of Yamuna bridge at Naini, Allahabad
- Field-studies on the integrity of Narmada bridge on Indore-Mumbai Highway



Sectional model of Yamuna bridge in the 1.5m X 0.5m Wind tunnel



Fatigue Testing System — 500 Kn capacity Actuator installed on Portal frame in DHT Lab

- ❖ Performance studies on first and second Thane creek bridges at Mumbai
- ❖ Use of ferrocement as wood substitute in buildings as doors & windows
- ❖ Integrity study of fire damaged Turbined Building of Narora Atomic Power Station-I
- ❖ Investigation of cause of hair cracks near the base of primary containment walls of Unit-I & II of

Narora Atomic Power Station and their repair scheme

- ❖ Wind tunnel investigation on 15m Triangular tubular towers

MAJOR TECHNOLOGIES TRANSFERRED TO INDUSTRY

- ❖ Technologies for the manufacture of ferrocement water tanks, septic tanks, digesters, bins, bio-gas holders, roofing units and manhole covers have been released to 83 firms.

TECHNOLOGIES READY FOR TRANSFER

- ❖ Long-term performance monitoring through field instrumentation
- ❖ Ferrocement building components, precast houses and other structures for economically weaker sections

FUTURE PROGRAMMES

- ❖ Analysis and design of bridges, their distress diagnostics, rehabilitation, strengthening, field monitoring for long-term performance studies
- ❖ Rational assessment of wind loads on structures like dwellings, industrial structures, (Chimneys & Cooling towers), lattice towers and TV towers for their wind resistant design
- ❖ Field monitoring of tall buildings, industrial structures and other tall structures for their behaviour under wind over long periods and also in the seismic zones
- ❖ Developing design capabilities for structures subjected to cyclones/ earthquakes
- ❖ Precommission and acceptance tests and long-term performance monitoring of nuclear containment structures
- ❖ Assessment of safety, distress diagnostics, rehabilitation and retrofitting of historical monuments

SPECIAL FACILITIES

Industrial wind tunnel

Dynamic-cum-Heavy test laboratory for component and scaled model tests under static, dynamic & fatigue loadings

A wide range of modern instruments for experimental stress analysis, and non-destructive testing of structures and components in the laboratory and field

Instrumentation for long-term performance monitoring

Distress diagnostics of existing bridges through field instrumentation

SERVICES OFFERED

Design and consultancy services

Field monitoring of long-term behaviour of structures subjected to wind and earthquake

Laboratory scale investigations on materials, structural components and scaled models under static and dynamic loadings

Wind tunnel investigations on structures and industrial complexes for the buildings industry

Development of dedicated software packages related to structural engineering problems

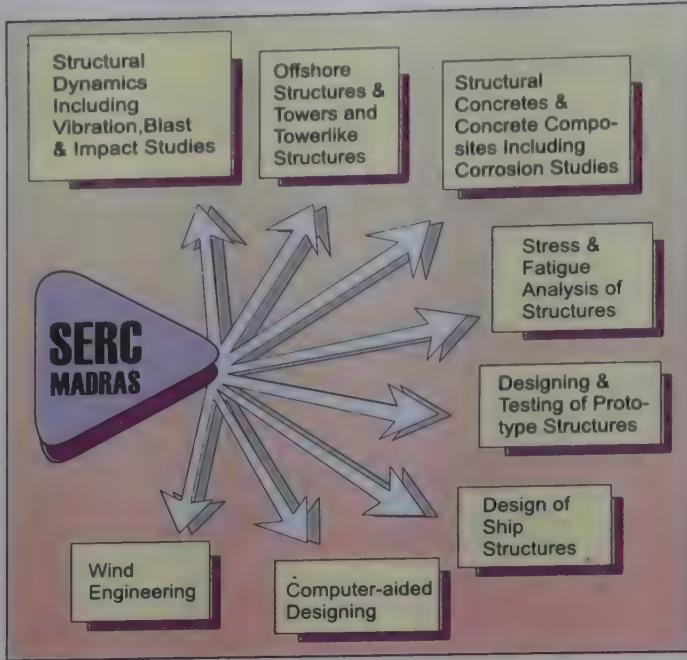
TRAINING PROGRAMMES

The Centre conducts training courses for industry, R&D Organisations, educational institutions and private organisations in the areas of its activity.

PUBLICATIONS

Annual Report

CONTACT PERSON: Director



Structural Engineering Research Centre, Madras (SERC-M)

CSIR Campus, TTTI, Taramani
P.O., Chennai 600 113

Telephone: 2352139
Telegram: SERCENTER, CHENNAI
Fax: 2350508, 2350973
E.Mail: sercm@sirnetm.ernet.in
: director@cssercm.rn.nic.in
STD Code: 044
Established: 1965

Director
Dr T.V.S.R.Appa Rao
Grant
1998-99
Rs. 870 Lacs
Manpower
Scientific & Technical: 80
Total: 290

MANDATE

- To carry out application-oriented research and develop know-how on analysis, design, construction and testing of all types of structures
- To act as a clearing house for the latest knowledge in its areas of activity

MAJOR R&D PROGRAMMES

- ★ Structural Dynamics, Experimental Mechanics and Wind Engineering
- ★ Off-shore and Ship Structures:
- ★ Transmission Line Towers and other Skeletal Structures
- ★ Computer Aided Analysis, Design and Software Development
- ★ Concrete Structures, Concrete Composites and Construction Engineering

SIGNIFICANT ACHIEVEMENTS

- ★ Conducted Assessment of dynamic response of a liquid-filled cylindrical tank under base excitation for IGCAR, Kalpakkam. Seismic qualification studies of gate valves, control valves with actuators and industrial assemblies for use in nuclear power plants, for various valve manufacturers.
- ★ The Centre carried out Analysis and design of launcher structures for Agni, Trishul and Prithvi missiles based on this, the launcher structures have been modified for



A gate valve under seismic qualification testing at the structural dynamics laboratory



Stress measurements in progress on in-service gas pipeline for Gas Authority of India Ltd.

making them safe and reusable for all these missiles.

★ Conducted investigation on the behaviour of buildings under

acoustic loads due to Satellite launch at Sriharikota Range.

- ★ Centre did Stress Analysis and Design guidelines for ensuring safety of in-service gas pipelines for ONGC and Gas Authority of India Ltd.
- ★ Investigations on automobile components for M/s. Sundaram Clayton and Axles India Ltd have been carried out.
- ★ Analysis of dynamic response of 80m high tower for the Department of Telecom; Development of designs for tower of free-standing and guyed configuration to carry 400 KV/765 KV power transmission lines; Testing of transmission line tower of 500 KV rectangular tower and 400/63 KV multicircuit for KEC International Ltd., Bombay for their clients in Egypt and Iran; Towers with wooden cross arms for M/s. L&T Ltd. for use in Malaysia; Designed towers for 800 kV transmission including self-standing and guyed towers of different configurations. Tested of two DC-towers with wooden X-arm for 132 kV and 275 kV transmission lines system for M/s Zelleco Engg. SDN BHD, Malaysia.
- ★ Installation and commissioning of an Atmospheric Boundary Layer Wind Tunnel facility with UNDP assistance; Calibration of the instrumentation systems for wind pressure measurement, data acquisition and analysis; Guidelines on the design and construction of buildings and structures in cyclone-prone areas formulated. Terminal Evaluation Mission has recognised SERC has been recognized as a Centre for Excellence for engineering of structures for mitigating damage due to cyclones; Tests completed on a model of a 220 m high chimney in the wind tunnel for Rajasthan State Electricity Board, Jaipur; In-



A side view of the 18 m long Atmospheric boundary layer wind tunnel



A 1:250 scale model of a RC chimney under investigation in the wind tunnel

vestigations on steel lattice tower supporting wind energy generators for Elecon Engineering Corporation, Gujarat and for Das Lagewey Wind Turbines Ltd., Madras.

• The Centre did Fatigue analysis under random loading of Corrosion behaviour of tubular joints for Dept. of Ocean Development; Carried out Assessment of static and fatigue strength of stiffened

steel tubular joints used in offshore structures; testing and evaluation for the Institute of Engineering and Ocean Technology and ONGC. Completed Evaluation of the relative fatigue performance of thermo-mechanically treated (TMT) reinforcing steel bars for SAIL. Carried out testing on crack growth on a 'T' joint of a steam header for Atomic Energy Regulatory Board. SERC made on Assessment of cracked tubular joints used in off-shore platform for ONGC; Worked out Fatigue life of dumper axle for Hindustan Motors; Fatigue and flexural behaviour of concrete members reinforced with TISCON CRS for TISCO.

- ★ Developed software for analysis and design of ship and ship structures for Hindustan Shipyard Ltd., based on development of user interface preprocessor modules. Developed software for the design of transmission line towers for M/s Electrical Manufacturing Co. Ltd., Calcutta. Developed successfully computer programme incorporating error estimator and adaptive finite element modelling for dynamic analysis of structures.
- ★ Created facilities and expertise for systematic investigation of distressed concrete structures, including corrosion-affected structures, and for formulation of recommendations for repair/rehabilitation. Investigations on damage and recommendations on repairs of buildings for Madras Port Trust, Senate House building of Madras University, Rayalaseema Thermal Power Project and Tamil Nadu Industrial Explosives; Assessment of damage due to fire of a framed building for BPL factory, Bangalore.
- ★ Developed expertise for design and production of steel fibre reinforced concrete, concrete composites, and high performance



A tower testing in progress at the Tower Testing & Research Station

concrete. Recent achievement is the development of a process for latex modified cement concrete using natural rubber lates.

TECHNOLOGIES READY FOR TRANSFER

- ★ High strength bar for concrete reinforcement
- ★ A process for making prestressed concrete poles using HSD bars and portable stressing beds
- ★ Small capacity ferrocement tanks
- ★ Prestressed concrete monoblock railway sleepers
- ★ A process for manufacture of latoblocks (building blocks from lateritics solids)

- ★ Fibre reinforced concrete-light, medium and heavy duty manhole covers
- ★ Ferrocement service core units
- ★ Techniques for repair of cracks in concrete by polymer injection
- ★ Polymer impregnated concrete products - tiles, pipes, panels and polymer overlays for industrial floor, deck slabs and pavements

FUTURE PROGRAMMES

Application of AI techniques and information technology in structural engineering

Damage assessment and rehabilitation of structures including life extension

Risk analysis and reliability - based design of structures

Development of high performance concretes

Earthquake engineering

SPECIAL FACILITIES

Structural dynamics laboratory with a medium duty test floor and uniaxial shaking-table facility having servo-controlled electro-hydraulic actuator of 100 kN capacity with facilities for high speed data acquisition and control. An Elastic Half Space Facility has also been setup.

Fatigue testing laboratory with heavy-duty floor and reaction walls and servo-controlled electro-hydraulic actuators of 500 kN & 1000 kN capacities with facilities for on-line data acquisition and control.

Concrete composites laboratory with a chemical laboratory, polymer impregnation equipment and testing machines.

Construction engineering laboratory with an outdoor casting yard and pre-tensioning bed and non-destructive testing equipment for damage assessment of distressed concrete structures, including corrosion studies.

Experimental stress analysis laboratory with equipment for techniques such as photoelasticity, laser holography, speckle interferometer and moirerefrainges and strain measurement.

Wind Engineering Laboratory with a boundary layer wind tunnel of test section 1.8m x 2.5m, to generate wind speeds up to 55 m/s and a mobile laboratory for field measurements and experiments.

Tower Testing and Research Station for testing towers upto a height of 65 m and a base of 20mx20m using electro-hydraulic servo system.

Heavy testing laboratory with a heavy duty test floor capable of testing prototype structures.

SERVICES OFFERED

For problems relating to analysis, design, construction and testing of models/prototype structures and structural components.

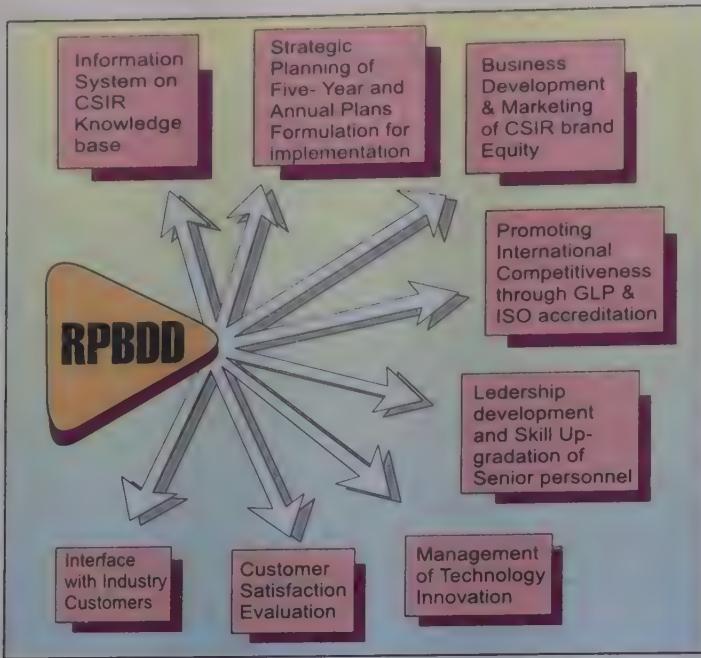
TRAINING PROGRAMMES

The Centre conducts advanced training courses in structural engineering for practising engineers.

PUBLICATIONS

Annual Report, Journal of Structural Engineering (quarterly), SERC Newsletter (quarterly) and handbooks, brochures, technical reports.

CONTACT PERSON: Director



R&D Planning and Business Development Division (RPBDD)

CSIR, Rafi Marg,
New Delhi 110 001

Telephone: 3730681
Telegram: CONSEARCH NEW
DELHI
Fax: 3710340, 3710618
E.Mail: csirhq@sirnetd.ernet.in
csirhq.ren.nic.in
STD Code: 011

Head
Dr H.R. Bhojwani

Grant
1998-99
25 lacs

Manpower

Scientific & Technical: 15
Total: 35

MANDATE

- To interact with Planning Commission and Ministry of Finance for (a) Five Year & Annual Plan allocations for CSIR and (b) integrating CSIR programmes with the plans of socio-economic Departments & Ministries.
- To review and allocate financial resources to CSIR Laboratories.
- To catalyze business development by interfacing with national-level industry associations, user agencies, financial institutions and technology licensors.
- To promote and facilitate marketing of CSIR's knowledgebase and services.
- To maintain information/ database on CSIR's R&D output and marketable knowledgebase and its utilisation.
- To enhance the level of standards of safety and promote good laboratory practices in the laboratories.
- To promote safety and total quality consciousness as also internal human resources development in the CSIR system.

MAJOR PROGRAMMES

Formulating S&T Plans:

- Preparing Five Year and Annual Plans for CSIR

– Allocating financial resources to the laboratories

– Carrying out appraisal of R&D and Business Plans of laboratories

Marketing of knowledgebase:

- Facilitating the marketing of CSIR knowledgebase through:
- Devising protocols, procedures and guidelines for marketing different components of knowledgebase
- Assisting laboratories in negotiations and drafting of legal instruments for contracting different components of the knowledgebase
- Evolving strategic alliances with domestic and foreign technology transfer & marketing agencies.
- Bringing out publicity material in the form of films, publications, brochures, reports on diverse activities and achievements of CSIR

Enhancing CSIR capability for business development & marketing of knowledgebase by:

- (i) Assisting in establishment of Marketing/Business Development Groups for the laboratories
- (ii) Assisting in preparation of Business Plans by the laboratories
- (iii) Sensitizing and training of CSIR personnel in aspects of business development and marketing of knowledgebase.

Interfacing with Industry and Other Constituents in the Innovation Chain:

- Actively interacting with all India level industry associations such as federation of Indian Chambers of Commerce and Industry (FICCI), Associated Chambers of Commerce (ASSOCHAM), Confederation of Indian Industry (CII), Indian Chemical Manufacturers Association (ICMA), Indian Drug Manufacturers Association (IDMA); technology transfer agencies such as NRDC, BCIL; and financial institutions such as TDICI, ICICI, etc. by jointly arranging seminars, workshops, exhibi-

tions in general as well as specific industrial sectors.

- Assisting local, small and medium sized industrial units in identification and solving of their scientific and technological problems through seven Polytechnology Transfer Centres (PTCs) set up in state capitals.

Information Systems on CSIR's Research Output and Its Utilization:

- Maintaining Information on CSIR's research output and its utilization. Databases have been established for:
- Processes/knowhow/designs and patents developed by CSIR laboratories
- Processes/knowhow/designs and patents licensed and commercialized
- Contract research (yearly)-on going and completed
- Consultancy services provided by CSIR laboratories (yearly) - on going and completed

Improving and Upgrading Safety Standards in CSIR:

- As the CSIR laboratories undertake R&D work of international level, their protocols and practices for safety in laboratory work should also attain the same level; therefore, a project on "Improving and Upgrading Safety Standards in CSIR" has been launched, for which the World Bank has provided a grant, inter-alia with the objectives of:
- Assessing the level of safety standards/practices in laboratories
- Devising and specifying protocols for safety in lab work for different areas of R&D and their implementation
- Maintaining a database on aspects of adherence to safety in CSIR laboratories

- Creating awareness for laboratory safety and organizing training programmes in laboratory safety systems
- Collecting and disseminating information on developments in laboratory safety-standards, equipment, etc.

Establishing Quality**Management Systems in CSIR Laboratories:**

- For improving efficiency of work procedures and ensuring ownership and commitment of the staff in respect of the Institute's programmes and activities, CSIR Hq. has given all out support to laboratories to train staff in ISO 9000 quality systems and establish quality system in the laboratories.

SIGNIFICANT ACHIEVEMENTS

★ The Division has made noteworthy contributions towards creating awareness and a climate for business development and marketing in CSIR and for projecting CSIR's knowledgebase and expertise, both in India and abroad. Some of the achievements are:

- ★ Devising 'Model agreements' for contracting different components of CSIR knowledgebase thereby devolving autonomy for the laboratories to deal with the IPR contracts expeditiously of their level
- ★ Synergising the strength of CSIR system to undertake multi-laboratory consultancy assignments.

- ★ Evolving alliances with Industrial Credit and Investment Corporation of India (ICICI), Confederation of Indian Industry (CII) and Federation of Indian Chambers of Commerce and Industry (FICCI) for jointly working on R&D projects. Innovative mechanisms for raising financial resources, fostering linkages with industry, human resource development, etc.

RPBDD

- ★ Arranging for marketing of CSIR knowledgebase in USA by Global Exchange of Technology, USA
- ★ Carrying out fire safety audit of CSIR laboratories
- ★ Providing consultancy to Asian & Pacific Centre for Technology Transfer (APCTT) on Technology Promotion: Experiences of seven countries in the Asian region.
- ★ Setting up of Technology Advisory Cell (TAC) functioning with a two tier mechanism viz. at central level and at laboratory level to assist industries to realize optimal returns from their assets and achieve technological competitiveness.
- ★ Organizing training programmes for senior CSIR personnel to familiarize them with the implications and impact of changing economic, political and intellectual property scenario on R&D.
- ★ Creating a database on laboratories profiles on manpower cash-flow, recent achievements/programmes.
- ★ Financial support to laboratories which could put in place the ISO-9000 Quality Management Systems by 31.3.1998.

FUTURE PROGRAMMES

Assisting laboratories in preparation of their Business Plans

Strengthening CSIR manpower capabilities for marketing of its knowledgebase through structured training courses and exchange of visits and experts with similar successful organisations abroad.

Strengthening of existing mechanisms and identifying new mechanisms and avenues for marketing of CSIR knowledgebase.

Devising overall and sectoral marketing strategies for CSIR

Strengthening safe laboratory practices and adoption of good lab practices in CSIR laboratories.

Devising area/sectoral safety protocols for CSIR laboratories.

Creating databases on (i) potential CSIR clients; (ii) potential technologies for development and (iii) CSIR's manpower; capabilities and facilities

Extending international linkages for joint contract R&D and marketing of CSIR knowledgebase.

TRAINING PROGRAMMES

The Division has recently organised a series of custom designed programmes of 2 to 5 days duration for Directors and Senior Officers on diverse topics like Change Management, Organisation Restructuring, Transformational Leadership, Human Resource Management & Financial Analysis. Similar courses were organised for administrative & finance personnel at lower levels of echelons, and scientists and engineers at starting & middle levels to widen their horizons and improve their understanding and skills.

Earlier it had organised training courses on Technology Evaluation & Pricing, R&D Priority setting, India-New Economic Dimension, Technology Assessment, Making licensing Deals and Technology & Corporate Strategy. An Indo-German Workshop on Technology Development and Transfer was organised by the Division jointly with Department of Science & Technology. The Division in association with Asian and Pacific Centre for Technology Transfer (APCTT) and National Small Industries Corporation (NSIC) organized workshops on Technology Acquisition and Modernization of Small Scale Industries of Ahmedabad, Bangalore, Mumbai, Calcutta, Cochin, Delhi, Indore, Ludhiana, Madras and Goa.

PUBLICATIONS

The Division has brought out following publications recently:

CSIR Scientific & Technological Knowledgebase - reference document on R&D expertise, services and major S&T facilities in CSIR laboratories.

Tech Opportunities - contains preliminary techno-economic information on selected technologies of CSIR which have good market potential.

Proceedings of the Training Programme on Technology Evaluation & Pricing - contains lectures and case studies presented by resource persons and participants from India and abroad on practices/strategies for evaluation & pricing of technology developed in R&D organisation/institute.

Proceedings of the Workshops to assist the Small Scale Industries on Technology Acquisition & Modernisation (published by NSIC) - contains a record of the proceedings and major recommendations of the workshops.

Technology Promotion Experiences of Asian Countries (published by APCTT) - contains an overview of the technology promotion experiences of the seven Asian countries, namely Bangladesh, Nepal, India, Indonesia, Thailand, Pakistan & Sri Lanka.

R&D Community - Enterprise Cooperation (published by APCTT) - contains experiences and views expressed on behalf of enterprises, R&D Institutions/agencies of the Asian region on enhancing commercialization of R&D outputs in the region.

The Division also publishes:

Safelab - a quarterly wall paper to create and promote awareness about safe laboratory practices on a wider basis among the staff of the CSIR.

CONTACT PERSON: Head
(RPBDD)

CSIR - Polytechnology Transfer Centres

The Polytechnology Transfer Centres (PTCs) presently functioning in seven state capitals, set up by CSIR in collaboration with the respective State Government, offer diagnostic service and assistance to the industry, specially small scale in the state and contributes generally to the development effort in the state through indiginous S&T inputs. Head (RPBDD) exercises administrative control over the PTCs. The seven PTCs are:

1. CSIR-Polytechnology Transfer Centre,
0-17, New Mental Complex Asarwa,
Ahmedabad-380016
Telephone/Fax:(079)2124085

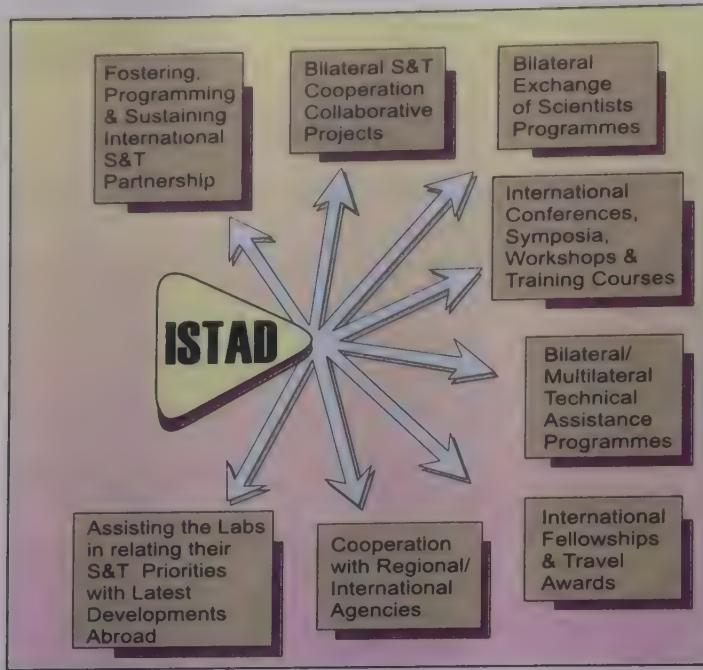
Gram: CONSEARCH,
AHMEDABAD

2. CSIR - Polytechnology Transfer Centre,
6th Rashtrouthana Parishat Bhawan,
14/3-A, Nrupathunga Road,
Bangalore-560002
Telephone/Fax:(080)2211464
Telex:0845-271 NAL IN
Gram: CONSEARCH, BANGALORE
3. CSIR - Polytechnology Transfer Centre,
A-Block, Guru Teg Bahadur Complex,
Roshanpura, Bhopal-462003
Telephone/Fax:(0755)554327
Gram: CONSEARCH, BHOPAL
4. CSIR - Polytechnology Transfer Centre,
India Exchange Place, 7th Floor,
Calcutta-700001
Telephone/Fax:(033)2203508

Telex:021-7432 ISMA IN
Gram: POLYSERVE, CALCUTTA

5. CSIR - Polytechnology Transfer Centre,
Directorate of Industries Compound,
Chirag Ali Lane, Hyderabad-500001
Telephone/Fax:(040)3202167
Telex:0425-7601 ABC IICT IN
Gram: CONSEARCH, HYDERABAD
6. CSIR - Polytechnology Transfer Centre,
C-46, Nirala Nagar,
Lucknow-220007
Telephone/Fax:(0522)374083
Telex:535-286 CDRI IN
Gram: TECHTRANS, LUCKNOW

7. CSIR - Polytechnology Transfer Centre,
Udyog Bhavan, 2nd Floor, East
Gandhi Maidan,
Patna-800004
Telephone/Fax:(0612)670134
Gram: POLTECH, PATNA



International Science and Technology Affairs Directorate(ISTAD)

CSIR, Rafi Marg,
New Delhi 110 001

Telephone:3714208
Telegram:CONSEARCH NEW
DELHI
Fax:3739041
E.Mail:bhandari@csirhq.ernet.in
:csirhq@sirnetd.ernet.in
STD Code: 011

Head

Dr R.K. Bhandari

Grant

1998-99
110 lacs

Manpower

Scientific & Technical: 10
Total:40

MANDATE

- To help make CSIR's scientific & technological knowledgebase internationally competitive by all possible means, especially by vibrant national and international networking and partnership.
- To assist the CSIR system in scouting for, and pinpointing, the very latest of internationally competitive scientific and technological advances, and breakthroughs of relevance to India, that should mould, shape and energize CSIR's current and future research and development initiatives.
- To build and fortify bridges of understanding between the CSIR and all its major overseas Science and Technology partners to develop synergies and leverage CSIR's capabilities in core areas of S&T interest.
- To reinforce CSIR's existing S&T base through international scientific and technological collaborations, twinning of institutions and such other initiatives.
- To vitalise CSIR's inputs through engineered training and retraining of scientists in core sectors (to be pinpointed from time to time), and at the same time help exploit the enormous trainer potential of the CSIR laboratories to forge and reinforce international partnerships.

MAJOR PROGRAMMES

★ CSIR Partners more than 40 bilateral programmes with 30 countries, besides being a major player in Intergovernmental agreements signed by the Department of Science & Technology. The scope of the International Science & Technology Affairs Directorate's technical operations fall in the following categories:

BILATERAL PROGRAMMES (Collaborative Projects & Exchange Programmes)

Europe West

Germany

- Forschungszentrum (KFA)
- German Aerospace Research (DLR)
- Environment & Biomedical Research (GSF)
- German Academic Exchange Service(DAAD)
- Max Plank Society (MPG)
- Vauxwagen
- Fraunhofer Gessellschaft (FhG)
- Indo German S&T Committee

UK

- Indo-UK Initiative
- Biotech & Biological Research (BBSRC)
- Indo-British partnership
- Imperial Cancer Research (ICRF)
- British Council Link Scheme
- INSA/Royal Society Exchange

France

- Centre National de la Recherche Scientifique (CNRS)

Italy

- Consiglio Nazionale delle Ricerche (CNR)
- Indo-Italian S&T Coop.

Europe East

- Polish Academy of Sciences (PAS)

- Academy of Science of the Czech Republic (ASCR)
- National Council of S&T, Romania (NCST)
- Slovak Academy of Sciences (SAS)
- Indo-Russian ILTP

Asia Pacific & North America

- Japan-Agency for Industrial Science & Technology (AIST)
- Singapore-National S&T Board (NSTB)
- Thailand-Thailand Institute of Scientific & Technological Research (TISTR)
- China-National Natural Science Foundation (NSFC)
- China-Chinese Aeronautical Establishment (CAE)
- China-State Bureau of Technical Supervision (SBTS)
- Indo-China S&T Coop.
- Nepal-Royal Nepal Academy of Science & Technology (RONAST)
- Korea-Korean Research Institute of Chemical Technology (KRICT)
- Australia-Dept. of Industry, Science & Tourism (DIST)
- Peru-National Academy (CONCYTEC)
- Banglades-Bangladesh Council of Scientific & Industrial Research (BCSIR)
- Vietnam-National Centre for Science & Technology (NCST)
- Mongolian Academy of Sciences (MAS)

Middle East/Africa

- South Africa-Council of Scientific & Industrial Research (CSIR)
- Nigeria-Nigerian Building & Road Research Institute(NBRRI)
- Sudan-National Council of Research (SNCR)
- Turkey-Scientific & Technical Research Council of Turkey (TUBITAK)

- Kuwait-Kuwait Institute of Scientific Research (KISR)
- Syria-Scientific Studies Research Centre(SSRC)
- Jordan-Royal Scientific Society (RSS)
- Saudi Arabia - Saudi Arabian Standards Organisation (SASO)
- Indo-Iranian S&T Coop.
- Indo-Israeli S&T Coop.

TECHNICAL ASSISTANCE PROGRAMMES

US (India) Fund Programmes

At the twilight of the US (India) Fund Project, which is due to end in February 1998, there are 27 ongoing programmes involving grants totaling Rs.830 million of various CSIR laboratories. Some of the major programmes include R&D on Malaria at CDRI (Rs.20 million), Interferons at CDRI (Rs.15 million), Biodeterioration & Biochemical Studies at NIO (Rs. 22 million) and High Resolution X-ray Diffraction at NPL (Rs.6.5 million).

In addition, 25 projects are at various stages of processing at US Embassy/ST/Ministry of Finance with envisaged grants amounting to Rs.60 million approximately.

Bilateral Technical Programmes

Some of the major bilateral programmes with countries (e.g. Germany, Netherlands, Sweden, Canada, Japan, etc.) are: Standards and Nickel Extraction - DM 8 million; Leather Sector in the field of Environmental Technology-Dfl 3.3 million; Lactic Acid & Tree Tissue Culture-Skr 2.5 million; CD-ROM of Asian Health, Environmental & Allied Databases - Procurement of Oceanography Vessel (\$ 10 million) is in pipeline.

Indo-French Projects

Currently 18 projects are in progress. Project proposals are invited twice a year for consideration by Scientific

ISTAD

Council and GB of Indo-French Centre for Promotion of Advanced Research (IFCPAR).

Indo-European Economic Community Programmes

Currently, there are eight projects; project proposals solicited under Fourth Framework Programme of EEC; further expansion of areas and scope with EEC being followed. CSIR also participates in India-EU Economic Cross cultured programme.

UNESCO

CSIR actively participates in the shaping of Unesco's activities in India, as a member of the Natural Sciences Sub-commission of the Indian National Commission for cooperation with Unesco. CSIR also participates in the UNESCO's participation programme.

REGIONAL PROGRAMMES

Commonwealth Science Council (CSC)

CSIR (ISTAD) represents India at the CSC. Three major flagship projects of CSC are biodiversity energy & water resources.

Additionally, CSIR plays a lead role in the project on 'Chemical Research and Environmental Needs' (CREN) with participation of India, Pakistan, Sri Lanka, Bangladesh, Australia, Papua, New Guinea, Singapore, Malaysia. The project has seven components related to environmental issues. India leads in two components, viz. methane emission (NPL), pesticide residues (ITRC), and participates in two others, viz. air pollution modelling (NEERI; lead country-Australia) and atmospheric acidification (NPL & IITM, Pune; lead country-Australia). India has offered to house the project, the proposal is under consideration.

The following official meetings occur periodically:

Triennial Council Meetings of CSC

Biennial Executive Committee Meetings of CSC

Other important meetings of Commonwealth Sectt, viz. Senior Officials Meeting (SOM), Steering Committee of Senior Officials (SCOSO), Commonwealth Consultative Group on Technology Management (CCGTM), Commonwealth Heads of Government Meeting (CHOGM), etc.

South Asian Association of Regional Cooperation (SAARC)

India is a member of SAARC along-with other South Asian countries; CSIR participates in Scientific Programmes decided by S&T Committee of SAARC; SAARC Documentation Centre is managed by INSDOC in New Delhi. ISTAD coordinates all the scientific programmes under the aegis of SAARC on behalf of CSIR.

Association for Science Cooperation in Asia (ASCA)

CSIR represents India on the ASCA and its National Secretariate is located at CSIR Hqrs. It meets every two years and a meeting of High level officials in S&T held in the alternative year. The thirteenth ASCA meeting was held in Manila in November 1994. Followup actions on its programme/activities/decisions are co-ordinated by ISTAD.

World Association of Industrial & Technological Research Organisation (WAITRO)

CSIR is a founder member of WAITRO and plays a major role in its activities which are coordinated by ISTAD.

HUMAN RESOURCE DEVELOPMENT THROUGH FELLOWSHIP/TRAINING/CONFERENCES

Fellowship/Training/Conferences

About 100 CSIR scientists get opportunity for overseas training annually

under various fellowship programmes:

- Raman Research Fellowship
- DAAD Fellowship
- UNESCO/UNIDO Fellowship
- BOYSCAST Fellowship
- JICA Fellowship
- British Council (TCTP)

ISTAD also facilities participation of CSIR scientists in International Conferences/Workshops etc. Annually about 350 scientists are deputed for participation in international conferences abroad.

As a part of national human resource development plan, CSIR plays a key role through ISTAD for providing financial support for participation in international conferences by the academicians and scientists of non-CSIR establishments. Annually about 300 scientists are supported under this initiative.

International Networking

International Training Programmes

CSIR, through its national laboratories, conducts a variety of regular and tailor made training programmes in various fields of science and technology. CSIR laboratories run regular Doctoral and Master's programmes in the area of Food Science (CFTRI), Leather Technology (CLRI) & Electrochemistry (CECRI). Most senior scientists are registered as a recognised guides.

Many CSIR laboratories imparts training in specific and technology to suit the specific requirements of developing and developed countries.

- Aerospace
- Biology & Biotechnology
- Building materials, housing & construction
- Drugs and pharmaceuticals
- Electrochemistry
- Electronics and instrumentation

- Environment technology and waste water treatment
- Fuel technology
- Food processing
- Glass & ceramic technology
- Information Systems
- Leather
- Mechanical engineering
- Medicinal plants
- Minerals, metals & materials
- Marine sciences
- Petroleum and petrochemicals
- Road research
- Science Communication

CSIR Fellowship for Developing Countries

To provide an opportunity to the scholars of developing countries for higher studies leading to PhD and post-doctoral research at CSIR labs,

CSIR has launched following two schemes in association with the Third World Academy of Sciences (TWAS), Italy:

- CSIR-TWAS Postgraduate studies (2-3 years)
- CSIR-TWAS Postdoctoral studies (upto 1 year)

As per the arrangement, while TWAS meets the cost of international transportation, CSIR pays/meets the stay expenses by providing fellowships. Foreign fellows are also provided free accommodation plus medical facilities.

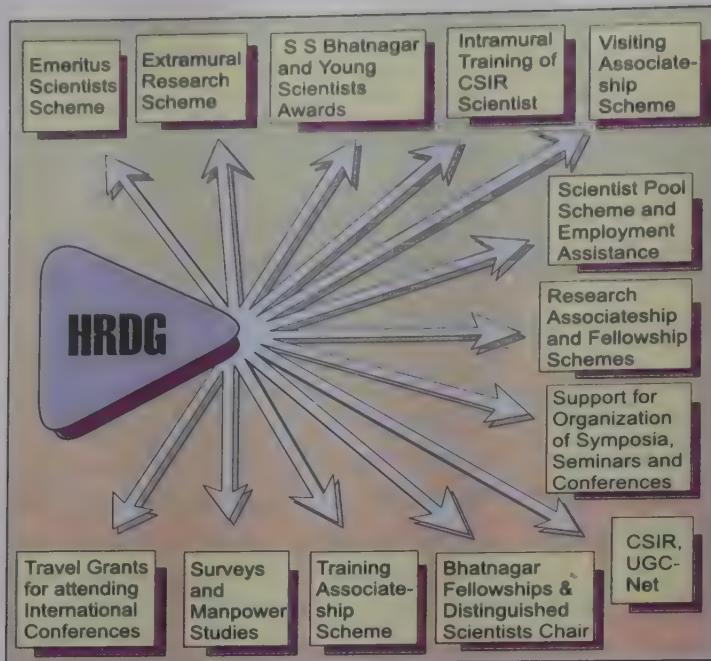
GOI-UNDP UMBRELLA PROGRAMME

The project integrates three component viz. (1) Transfer of Knowledge through Expatriate Nationals (TOK-TEN) (2) Technical Cooperation

among Developing Countries (TCDC) and (3) United Nations International Short Term Advisory Resources (UNISTAR) under an umbrella programme to create synergy and generate greater impact.

The development objective of the project is to make available to India, advance technological know-how, specialised skill and highly qualified expertise from abroad, in key development areas. The programme chiefly aims at (a) upgrading the country's level of science & technology (b) promoting its application (c) enhancing productivity and (d) improving the quality of goods and services particularly of small and medium enterprises thereby contributing to sustainable human development.

Contact Person : Head, ISTAD



Human Resource Development Group (HRDG)

CSIR Complex, NPL Campus,
Pusa, New Delhi 110 012

Telephone: 5788704, 5789845,
5748632, 5760580
Telegram: CONSEARCH, NEW
DELHI
Fax: 513371
E.Mail: cscircx@giasd101. vsnl.
net.in
STD Code: 011
Established: 1989

Head

Dr Sukumar Mallick

Grant

1998-99
5950 lacs

Manpower

Scientific & Technical: 20
Total: 240

MANDATE

- To have an integrated approach to the National Human Resource Development for Science & Technology (S&T) by encouraging and promoting research in the Universities and Institutes of higher learning
- To promote and foster the upgradation of the stock of well qualified, highly specialized scientists, engineers and technologists for R&D in all disciplines of science and technology in the country
- To conduct surveys and studies on availability and utilization of S&T Human Resource Development in India
- To support organisations to hold symposium, seminars and conferences which help in promoting scientific temper.

MAJOR PROGRAMMES

- ★ Relate to development of manpower for S&T in India through funding of research projects, award of research fellowships, funding of symposia/seminars, etc., and fostering of excellence in research through presentation of

awards for excellence in scientific research done in the country.

- ★ Excellence in S&T research is recognized by giving away of Shanti Swarup Bhatnagar(SSB) Prizes in the areas of Biological, Chemical, Earth, Atmospheric, Ocean and Planetary, Engineering, Mathe-



The Prime Minister Shri A.B. Vajpayee presiding over the 25th presentation ceremony of Shanti Swarup Bhatnagar Prize distribution for the year 1997. Alongwith the PM are Dr. M.M. Joshi, Minister for HRD and S&T and Dr.R.A.Mashelkar, Director-General, CSIR



Shanti Swarup Bhatnagar awardees for the year 1997 seen alongwith Shri Atal Behari Vajpayee, Prime Minister of India Dr. M.M. Joshi, Minister for HRD and S&T, Dr. R.A. Mashelkar, Director-General, CSIR and Dr. A.K. Raychaudhuri, Director, NPL, New Delhi

matical, Medical and Physical Sciences. SSB Prize consisting of a citation, a plaque and Rs.1.00 lac which is the most coveted honour for an Indian Scientist has been awarded to 332 scientists/engineers till 1997. Young researchers within the CSIR system are encouraged through the 'Young Sci-

entist Awards' ;(Award consisting of a citation, a plaque and Rs.25,000). Till 1997, seventy scientists received this award.

④ Evaluation of the impact of extramural (EMR) support being provided by CSIR to the universities and other institutes of higher

learning, Training and educational programmes for human resource development and Dissemination of information relating to availability and utilization of S&T manpower in India and compilation of comprehensive information on CSIR scientists and their achievements.

★ Collaborative projects taken up by faculty members from Universities and CSIR laboratories funded through a programme of 'Sponsored Schemes'.

SIGNIFICANT ACHIEVEMENTS

★ Surveys and manpower studies carried out on the availability and utilization of S&T human resource.

★ The group has supported around 50,000 research fellowships/associateships , PG colleges, IITs etc. and 10000 Senior Research Associates so far.

★ Stipend has provided to highly qualified scientific and technical personnel selected under the Senior Research Associateship Scheme (Scientist's Pool Scheme). Till 1998 around 20000 persons have been selected for SRA ship till March 1998.

★ Guest scientists acquaint themselves with scientific industrial research by working on short term projects and using the facilities available in the CSIR setup under the "Visiting Associateship Schemes".

★ Under the Emeritus Scientist (ES) Scheme, financial assistance is provided to outstanding superannuated scientists to make use of talented and experienced researchers for the advancement of science.

FUTURE PROGRAMMES

The major objectives of HRDG in future will be to increase efficiency and effectiveness of Human Resource

Development for S&T through new and on-going research support programmes and create opportunities for training in new research techniques and education in frontier areas

Under this scheme top fifty students at the secondary school examination (Class X) from CBSE and State Boards will be invited at CSIR expenses to visit the nearest laboratory for two open days alongwith their parents/teachers/gaurdians. During the period they will get popular science lecture by eminent S&T personages. Audio visual presentation on the contributions in science made by eminent scientists and technologists

to the world of knowledge technology and industry and will told about the opportunities in scince. This will give them the glimpse of scientific research being carried out in the field of their interest. Finally among students who persue science after Class X would be provided support and facilities to do their project work for Class XI & XII at one of the CSIR laboratories.

The most significant scheme is the implementation of CSIR Programme in Youth for Leadership in Science. The objective of the scheme is to expose the Young minds to the exciting world of science which will in turn to help in building up a scientific tem-

per at an early age this will instil a sense of pride in the achievements of Indian Science.

PUBLICATIONS

Books/Reports

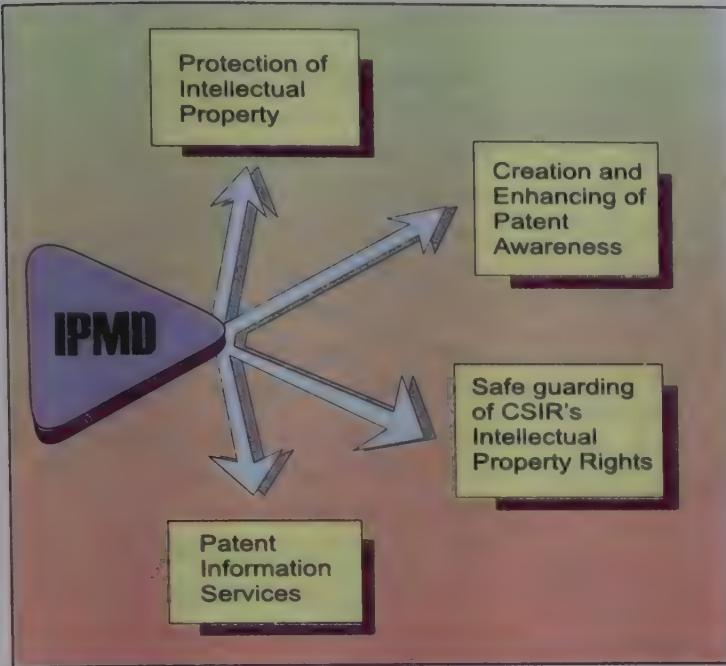
Profile of CSIR Scientists

Directory of CSIR Scientists

In house publication of current status of senior research associates (Scientists' Pool Scheme) 31 March 1998

CSIR Young Scientist Awards; 1987-1996

CONTACT PERSON: Head (HRDG)



Intellectual Property Management Division (IPMD)

INSDOC Building, 14, Satsang Vihar Marg, New Delhi 110 067

Telephone: 6962560, 6968819
 Telegram: CONSERPAT, NEW DELHI
 Fax: 4670091
 E-Mail: root@csptntu.ren.nic.in
 STD Code: 011

Head
 Mrs L. Balasubrahmanyam
Manpower
 Scientific & Technical: 10
 Total: 25

MANDATE

- To advise on all matters relating to Intellectual property protection
- To secure and safeguard Intellectual Property generated in CSIR under appropriate legislations in India and abroad
- To maintain patent databases and disseminate technical information contained in patent documents amongst scientists
- To maintain Patents Inspection Centre established under the Indian Patents Act, 1970
- To organise various programmes for enhancing awareness about the Intellectual Property Law and their operation at national and international levels
- To train scientists in the Labs about the identification of patentable inventions and their legal protection

MAJOR PROGRAMMES

- ★ Protection of Intellectual Property
- ★ Securing Intellectual Property Rights for CSIR's R&D output, namely, Indian & foreign Letters of Patent, Registration of Design, Copyright & Trade marks and also

safeguarding against infringement of IPR secure.

- ★ Patent Information Services
- ★ Maintaining an Information System on Patent
- ★ Updation & maintenance of computer base Indian patent database

(INPAT) containing bibliographic information about Indian Patent from the year 1972 till date

- Making available on-line access to Indian Patent database (INPAT) to the public through INSDOC; this product is being launched on CD-ROMs soon
- Conducting, State-of-the-art Patent searches for evaluation and patenting of R&D output generated from CSIR laboratories
- Safeguarding of Intellectual Property Rights & Other Related Matters
- Handling of various proceedings under relevant provisions of Intellectual Property Legislation such as renewals, oppositions, infringements etc.
- Enhancing Awareness about Intellectual property system
- Bringing out publication on various aspects of Intellectual Property, particularly on Patent.
- Undertaking various programmes on organisation of training on IPR through workshops/seminars in CSIR laboratory/institutes on Zonal basis and also in different states in the country for the enhancement of awareness amongst scientists, technologists, academicians, entrepreneurs and R&D managers.

SIGNIFICANT ACHIEVEMENTS

- Enunciated CSIR's Policy on Intellectual Property

- Apart from its mandate of securing and safeguarding Intellectual Property rights for CSIR's R&D output, the division has made valuable contribution towards creating awareness about knowledge on Intellectual Property systems not only in CSIR labs but also amongst those in Industry, academic institution and other organisations. Division has also established a database on Indian Patents(INPAT).
- Expertise acquired in handling complex techno-legal issues at international level as shown by the success achieved in the re-examination proceedings against US patent No.5401504 on "Use of Turmeric for wound healing". All the claims of the said patent have finally been rejected by the United States Patent Office and a Re-examination Certificate to this effect has been issued thereupon.

FUTURE PROGRAMMES

Implementing CSIR policy on Intellectual Property System

Adoption of various measures to increase CSIR filing rate to International level

Increasing awareness of intellectual property by organising programmes in individual labs of CSIR, covering topics of drafting of documents, identification of patentable inventions; guidelines for taking precautions so as to build-up expertise on the subject in individual labs.

Setting up of a local cell in each lab to look after patent matters in order to

facilitate identification of patentable inventions at the earliest possible date and on the spot help to scientists on preparing write-ups on patents and to provide for a strong and efficient linkage between the lab and the IPMD to cope up with the volume of patenting targeted.

Providing a lead to the nation by launching a national mission on creating awareness in matters relating to intellectual property

Organisation of National Seminars in collaboration with World Intellectual Property Organisation (WIPO) on Intellectual Property System and its role in promoting innovative and inventive activities

Making available consultancy services to industry and other organisations on matters relating to intellectual property protection

PUBLICATIONS

Handbook entitled 'Intellectual Property protection in India-A practical Guide for Scientists, Technologists and other users' and Intellectual Property - ready reckoner; Basics of IPR; Questions and Answers on Intellectual Property Protection in India; Databases on Indian Patents

CD-ROM database on all the legislations on Intellectual Property throughout the world.

The division has also undertaken a detailed study on Indian Patenting activity for the period 1972-94.

CONTACT PERSON: Head (IPMD)

Societal & Technology Missions and Societal Programmes Division (STMD)

CSIR, Anusandhan Bhavan, Rafi Marg, New Delhi 110 001

Telephone: 3716372
Telegram: CONSEARCH NEW DELHI
Fax: 3711321, 3716372
STD Code: 011

Head
Dr H.R. Bhojwani
Manpower
Scientific & Technical: 15
Total: 35

MANDATE

- Societal programmes to solve problems of rural population through S&T inputs
- Conceptualisation and evolution of mission programmes by networking and synergizing the expertise and facilities of laboratories/institutions by interacting with Technology Advisory Boards, Research Councils, S&T Advisory Committees of Ministries, S&T Council of States, Planning Commission, Ministries/Departments, Industries/Agencies, National Laboratories
- Co-ordination, Review and Mid-course correction of mission programmes
- Facilitation of commercialisation of technology through technology demonstration/popularisation programmes and turnkey assignments for propagation of technologies developed
- Information system regarding mission programmes and organizing workshops & training programmes.

MAJOR PROGRAMMES

- Leather Technology Mission (LTM) is aimed to act as a technology driven development grid for

sustainable development of leather industry.

- Catalyzing formulation and approval of a successor programme

under "Vision beyond Mission" for propagation of successful technologies developed under LTM among industry/beneficiaries

- ★ National Technology Mission on Oilseeds, Pulses and Maize is to bridge the demand-supply gap of edible oils and pulses in the country through the development and introduction of modern and efficient agricultural, post harvest and processing technologies. Division coordinates with CSIR laboratories.
- ★ Identification of technology areas for R&D and inviting of proposals from CSIR, ICAR laboratories, institutions and universities etc.
- ★ Appraisal and approval of R&D programmes. Mobilization of funds from TMOP&M and allocation to the implementing national laboratories/agencies
- ★ Technical appraisal and review of ongoing programmes through quarterly progress reports and annual review meetings
- ★ Tie up between R&D institutions and industry for technology popularisation, technology marketing and technology transfer. Turn key project marketing based upon technologies developed
- ★ Rajiv Gandhi National Drinking Water Mission(RGNDWM): Catalyzing formulation and approval of R&D programmes for water source location, water conservation/augmentation and water quality analysis, treatment technologies for removal of excess iron, fluoride, salinity and ar-

senic and bacterial contamination from water

- ★ Clean Coal Technology (CCT):
- ★ Efforts to establish the techno-economic credentials of Integrated Gasification Combined Cycle (IGCC) technology for power generation with high ash coals
- ★ Techno-economic evaluation of globally available IGCC technologies and their suitability for Indian conditions and high ash Indian coals
- ★ Formulation of national collaborative programme for establishing pilot power generation plant in association with BHEL, Min. of Power, Deptt. of Coal, NTPC, Central Electricity Authority etc.
- ★ CSIR has been providing S&T based solutions to mitigate the vulnerability of weaker sections of society and to improve their quality of life, specifically through:
 - Technology development and modification suiting the specific needs
 - Identification of future technology needs and working out solutions
 - Propagation of appropriate technologies through training, demonstration, seminars and workshops at relevant fora
 - Interaction through inter-phase agencies e.g Ministry of Rural Development, DST, DBT, KVIC, State S&T Councils and NGOs
 - Setting up 'Windows' on Rural Technology at different locations in the country for providing two-way linkages between CSIR labs

and the users to identify potential technology needs in the region and diffusion of CSIR technologies

FUTURE PROGRAMMES

Conceptualizing and evolving new mission programmes viz. Technology mission on food processing, exploration of sub trap Mesozoic basins, etc. Synergizing expertise available in national laboratories, universities and industry

Approval of new mission programmes and mobilisation of EBR from Planning Commission, Ministries and Departments for new and ongoing mission programmes

TRAINING PROGRAMMES

The division organises and/or sponsors workshops, seminars and symposia in areas related to ongoing or new mission programmes

Human resource development of industry personnel are undertaken in collaboration with national laboratories in the operation and maintenance of plants, machinery & equipment developed under mission programmes

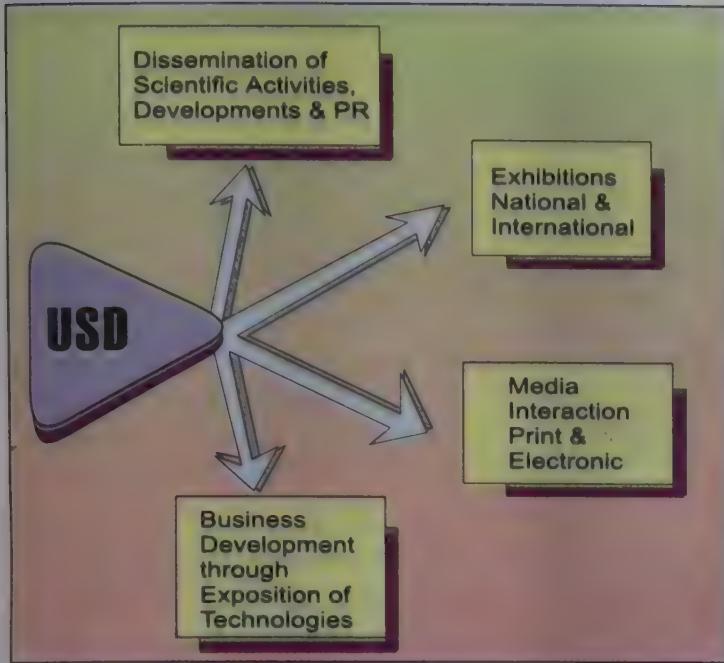
PUBLICATIONS

Profiles of different technologies, plant, machinery, equipment developed under mission programmes for awareness and marketing

Manuals for operation and maintenance of plant, machinery and equipment for users in association with national laboratories

Compendium on technologies relevant for rural development

CONTACT PERSON: Head (STMD)



Unit for Science Dissemination (USD)

CSIR, Rafi Marg,
New Delhi 110 001

Telephone: 3715241
Telegram: CONSEARCH NEW
DELHI
Fax: 3715241
STD Code: 011

Head
Shri T D Nagpal
Grant
1998-99
Rs. 16 Lacs
Manpower
Scientific & Technical: 2
Total: 7

MANDATE

- To create awareness about CSIR's S&T activities
- To build a favourable public image of CSIR
- To disseminate information on new processes /products/ technologies developed by the various laboratories of CSIR
- To help in business development through exhibitions and interaction with individual, entrepreneurs and the media-print as well as electronic

MAJOR PROGRAMMES

Interaction with Media:

- The Unit maintains close contact and regular interaction with the print and electronic media to disseminate important S&T developments in CSIR.
- The Unit for Science Dissemination has forged close links with all the major national newspapers, news magazines as well as with All India Radio, Doordarshan and private TV Channels.

Exhibitions:

- The Unit organizes display of CSIR technologies in select S&T expositions both in India and abroad to facilitate technology transfers and help in business development.

S&T Information:

- Important S&T developments in general and CSIR's achievements in particular are gleaned and collated from major newspapers and magazines on a daily basis.

USD



Dr. R.A. Mashelkar, DG, CSIR at a function of the Indian Science Writers Association



DG, CSIR coming out of the CSIR Stall in TECHMART Exhibition

Information Dissemination:

- ★ The Unit arranges Press Conferences and press party visits to various CSIR laboratories and issues press releases from time to time to publicize the achievements of CSIR.
- ★ To put across the views of the Director General and Directors of different laboratories, the Unit arranges interviews with the media.
- ★ The scientists of the Unit also utilize the various on-going programmes on All India Radio to highlight the S&T achievements of CSIR.

SIGNIFICANT ACHIEVEMENTS

- ★ The Unit has made noteworthy contribution in creating awareness about the newer processes/products/technologies developed by CSIR as well as its societal, economic and environmental commitments to the nation.
- ★ The Unit has created a favourable public image of CSIR through the electronic and print media.

FUTURE PROGRAMMES

The Unit has embarked on an ambitious orientation programme on Science reporting for journalists.

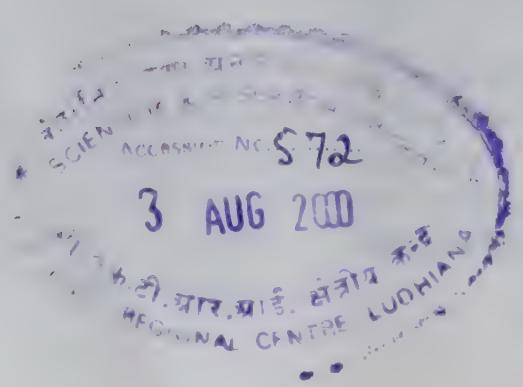
TRAINING PROGRAMMES

The Unit provides short-term training for students of science journalism.

PUBLICATIONS

The Unit is closely involved in bringing out the CSIR Hand Book as well as technical brochures.

CONTACT PERSON: Head (USD)





CSIR SERVICE TO CLIENTS

QUICK

**COST
EFFECTIVE**

CONFIDENTIAL

MECHANISMS

- SPONSORED R&D
- COLLABORATIVE R&D
- CONSULTANCY
- HUMAN RESOURCE DEVELOPMENT
- PRODUCT TESTING AND CERTIFICATION
- TESTING ANALYSIS AND CALIBRATION
- SUPPLY OF DATA AND INFORMATION

- :Client Funded, Times & Result Targetted
- :Mutual Sharing of Cost & Work
- :All Stages from Project concept to Commissioning
- :Specialised Areas, Customer Tailored
- :High Quality, Independent
- :Highest Standards of Accuracy
- :Authentic and Reliable

Further Information can be had from:

Head, Research Planning & Business Development, (Ph:011-3710340), and
Head, Unit for Science Dissemination, (Ph:011-3715241)

Our Science & Technology makes India proud

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Dr K.S. Krishnan Marg, Pusa, New Delhi 110 012
Fax : +11 5787062 E-mail : niscom@sirnetd.ernet.in.